ED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

METAL FINISHING

JULY, 1947 VOL. 45 • NUMBER 7

Founded as Metal Industry, January, 1903
by Palmer H. Langdon, 1868-1935

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Published Monthly by
METAL INDUSTRY PUBLISHING CO., INC.
11 West 42nd St. New York 18, N. Y.
Telephone: PEnnsylvania 6-0226

also publishers of
Organic Finishing, monthly, $1.00 per year
Guidebook-Directory for the Metal Finishing Industries, annually, $1.50

Copyright 1947 by The Metal Industry Publishing Company, Incorporated. Entered February 25, 1903, at New York, N. Y., as second class matter under Act of Congress, March 3, 1879. Re-entered as second class matter June 13, 1940, at the post office at New York, N. Y., under the Act of March 3, 1879.

SUBSCRIPTION PRICES: United States, $3.00 and Canada, $3.00 per year. Other countries $7.50. Single copies 35c in U. S. and Canada, Foreign 75c. Please remit by check or money order; cash should be registered.

Contributed articles, communications, etc, on pertinent subjects are invited. Their publication, however, does not necessarily imply editorial endorsement.

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COMING SOON

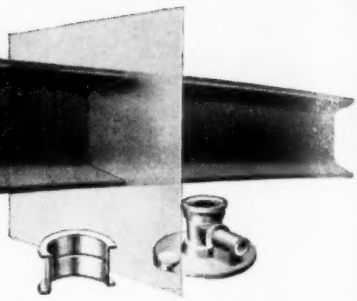
Toxicity of chemicals in electroplating. What to do for prevention and treatment of plating room accidents.

Electroforming molds for the production of rubber gloves used on artifical hands; plating technique listed.

Taxes and methods of calculating them in job plating shops; recommendations for simplified tax bookkeeping procedure.

Finishing of small electrical appliances, utilizing high production techniques; an interesting plant writeup.

FOR DEPENDABILITY



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CHEMICALS FOR THE METAL INDUSTRIES

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Acetic Acid
Ammonia Alum
Ammonium Thiosulfate Solution
Aqua Ammonia
Chromium Fluoride
Fluoboric Acid
Hydrofluoric Acid
Hydrogen Peroxide
Metal Fluoborate Solutions
Muriatic Acid
Nitric Acid
Potash Alum
Potassium Cyanide
Sodium Fluoride
Sodium Metasilicate
Stannous Chloride
Sulfuric Acid
Tetrasodium Pyrophosphate
Trisodium Phosphate

STEEL

Rimming Steel Manufacture

Sodium Fluoride

Steel Manufacture

Sodium Bisulfite, Anhydrous
Sodium Sulfite, Anhydrous
Sulfur
Iron Sulfide

Descaling

Glauber's Salt
Sulfuric Acid

PICKLING

Acetic Acid
Hydrofluoric Acid
Muriatic Acid (Hydrochloric)
Nitric Acid
Sulfuric Acid
Nitre Cake
Sodium Fluoride
Sodium Bifluoride

LIGHT METALS

Casting

Ammonium Fluoborate
Potassium Fluoborate
Sodium Fluoborate

HEAT TREATING

Barium Fluoride
Sodium Fluoride
Potassium Fluoride
Potassium Cyanide

FINISHING

Electrolytic Polishing

Acetic Acid
Perchloric Acid
Sulfuric Acid
Hydrofluoric Acid

Bright Dipping

Hydrofluoric Acid
Nitric Acid
Sulfuric Acid
Muriatic Acid (Hydrochloric)

Oxide Finishing

Copper Sulfate
Hydrofluoric Acid
Nitric Acid
Oxalic Acid
Sodium Silicate
Sulfuric Acid

Galvanizing

Sodium Fluoride
Hydrochloric Acid
Sulfuric Acid

ALKALI CLEANING

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Trisodium Phosphate (TSP)
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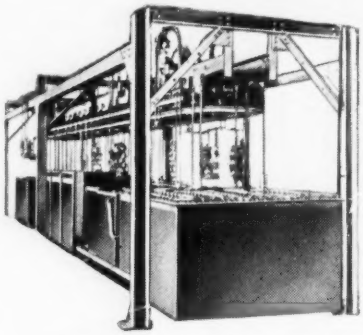
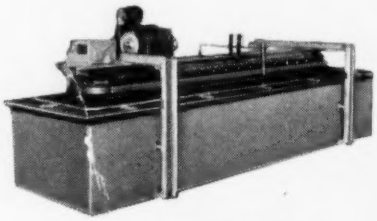
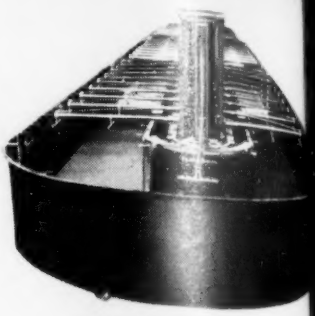
BURNISHING BARRELS



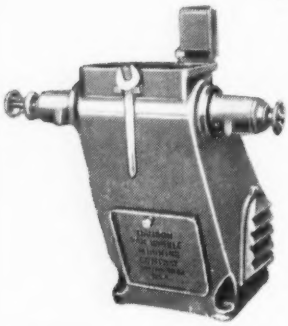
AUTOMATIC PLATING CONVEYORS
(Munning Type)



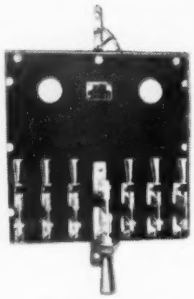
SEMI-AUTOMATIC
PLATING CONVEYORS



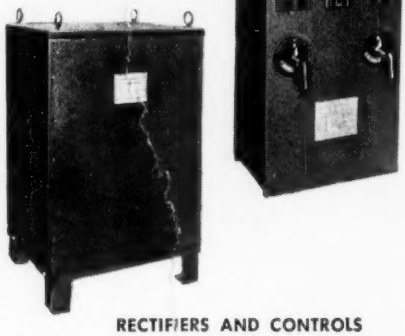
FULL AUTOMATIC CONVEYORS
(Elevator Type)



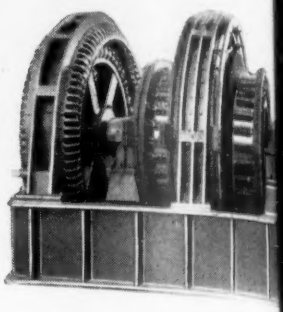
BUFFING AND POLISHING
LATHES



TANK RHEOSTATS



RECTIFIERS AND CONTROLS



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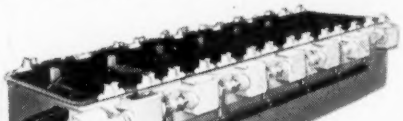
AND PROCESSES
GLUE & ABRASIVES
INSULATING TAPES
AND COMPOUNDS
MICROSCOPES (Electroplaters')

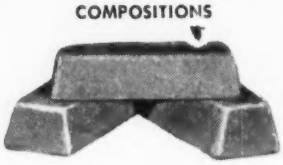


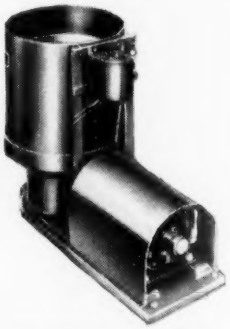
MULTIPLE PLATING
BARREL UNITS

BRUSHES

COMPOSITIONS

BUFFS





CENTRIFUGAL DRYERS

ELLIPTIC
ANODES

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ABLISHED 1903
OTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS
METAL FINISHING
OLUME 45 • NUMBER 7 • JULY 1947

Electroplating Information

One of the most difficult and important problems in the metal finishing field today is that of information exchange. Faulty or improper information, regardless how well intentioned, can prove disastrous in the plating room. Many a good dollar has been thrown after bad because 'I read it somewhere', or 'I heard it somewhere'.

One of the main sources of inadequate information is the series of technical bulletins, digests, abstracts, which are being offered throughout the industry for a fee, of course. Such information is, on the whole, out of date, incomplete and oftentimes inaccurate. As a rule, such bulletins are written by men who have never been inside a plating plant and who do not have the slightest idea of the practical applications involved, but who are interested primarily in making a sale.

If technical papers have merit, they will find their way into the literature, where they are available to all without charge. It is much more practical and economical to use authoritative information without cost than it is to pay for knowledge of dubious value. Particularly is this true for the returning veteran who is opening his own shop or who is returning to assume responsibility in a plating department, after having been out of touch with the field for many years.

Many methods can be used to combat such quacks. The simplest and most effective is not to buy the product; thereafter, such bulletins will be forced to improve the quality of information given, whereupon we will all welcome them into the field. Another is to utilize the current authoritative knowledge fully. Consult the local library, where reliable literature may be selected, in which is listed *Metal Finishing* magazine wherein lies a wealth of information accumulated over the last 45 years and which is a month-to-month guide on the industry; and *Metal Finishing's Guidebook-Directory*, a handbook containing all formulas, methods and processes used in metallic surface treatments, all tried and true.

The knowledge which keeps the plating executive abreast of the times is his most precious possession; it should be augmented with only the most accurate information.

American Electroplaters' Society Convention Breaks All Records

RECORD breaking registration amounted to over 1,600 members at the Annual Convention of the American Electroplaters' Society held at the Hotel Statler in Detroit, June 23-27. Visitors and members were present from all over the world, indicating the tremendous amount of interest in the electroplating industry today.

Attendance at the various meetings was exceptional, as members and their guests listened to a variety of papers on electroplating processes. The following list of papers was presented:

Stress in Electrodeposits and Its Significance—K. G. Soderberg and A. K. Graham.

Stress in Electrodeposited Nickel—William Phillips and F. L. Clifton.

Physical Properties of Electrodeposited Chromium—Abner Brenner, Polly Burkhead and Charles W. Jennings.

S. S. Johnston
Supreme First Vice-President

Kenneth M. Huston
Supreme President

Bright Brass Plating of Zinc Base Die Castings—Stanley J. Beyer.

Modern Applications of Electroplating Solution Purification—B. C. Case.

Electroforming Pitot Static Tubes—Alfred S. Kasdan.

Chemical Deposition of Nickel and Cobalt—Abner Brenner and Grace Riddell.

Recent Developments in the Use of Conversion Coatings on Zinc—J. E. Stareck and W. S. Cibulskis.

Bulk Nickel Plating—Henry Strow.

Manufacturing Process for Standard Sixty-Inch Reflector—Government Sound Film.

Barrel Chromium Plating—G. Dubpernell and S. M. Martin.

Standardization of Buffing for Preparation of Atmospheric Exposure Test Panels—C. C. Cupps and A. K. Graham.

Evaluation of Buffability of Nickel Deposits—R. D. Miller and A. H. DuRose.

Health Hazards in the Eelectroplating Industry—J. E. Molas.

Project No. 2—*Extraction Methods Applied to Electroplating Baths—Determination of Zinc and Other Impurities in Nickel Plating Solutions*—E. J. Serfass.

Project No. 4—*Effect of Surface Finish on Non-ferrous Base Metals on Protective Value of Plated Coatings*—George I. Kahan.

Project No. 5—*Some Effects of Copper in Nickel Plating Solutions*—D. T. Ewing.

Project No. 6—*Protective Power of Electrodeposits*—N. Thon.

Project No. 7—*Evaluation of Methods for Determining the Thickness of Electrodeposited Coatings*—Harold J. Read.

Arthur Logozzo
Supreme Second Vice-President

William J. Neill
Supreme Third Vice-President

Project No. 8—*General Considerations of Experimental Methods for Determining Polarization*—Alfred L. Ferguson.

Project No. 9—*Physical Properties of Electrodeposited Metal* — Abner Brenner.

Project No. 10—*Present Status of Plating Room Waste Disposal*—B. F. Dodge and D. C. Reams.

Prize awards for the papers presented at the educational sessions and those printed in the Review for the past year were given as follows: The Proctor award of $100 for the best paper at the Convention was given to *B. C. Case* for his paper entitled "Modern Applications of Electroplating Solution Purification." The A. E. S. Gold Medal was awarded to *E. A. Anderson* for his article entitled "Testing Plated Coatings on Zinc Base Die Castings." For the best paper printed in the Review by a member or a non-member in the last year, a prize of $50 was awarded to *C. L. Faust, B. Agruss, E. L. Combs* and *Wayne A. Proell* for their paper "Copper Plating in Alkanesulfonic Acid Baths." The joint paper of *K. G. Soderberg* and *A. K. Graham* entitled "Stress in Electrodeposits and Its Significance" won the Founders Gold Medal.

While not a prize winning paper, the presentation by *Miss Grace Riddel* of the joint paper of *Abner Brenner* and herself was outstanding. She very adequately covered a new plating subject and presented it in the language of the plater.

In the membership contest, the Philadelphia Branch received first award for Group I, having a gain in membership of 28%. The Group II award went to the Pittsburgh Branch, while the St. Joe Valley Branch received a prize for the third group with an increase in membership of 40%. All three groups were awarded handsome banners and a seal for use on their stationery.

One of the highlights of the Convention was the Job Platers luncheon at the Masonic Temple on Wednesday, which was given by courtesy of the job shop operators of Detroit. Well over a thousand attended and *Edgar A. Guest*, nationally known poet and humorist, gave his homey poetical prescription for the enjoyment of life.

At the annual meeting on Thursday afternoon, it was decided to again refer any change in the constitution to the branches and consider next year. The Newark Branch will be host at the Convention and Exposition in 1948, to be held in either Atlantic City or Asbury Park, N. J. Milwaukee was selected as the convention city the following year and Boston in 1950.

Frank Savage
Past Supreme President

Officers of the American Electroplaters' Society for the ensuing year were elected as follows: *K. M. Huston*, Baltimore-Washington Branch, president; *S. S. Johnston*, Pittsburgh Branch, first vice-president; *A. W. Logozzo*, Hartford Branch, second vice-president; *William J. Neil*, Columbus Branch, third vice-president; *A. K. Graham*, executive secretary.

Honorary members of the national society elected at the 1947 convention

Dr. A. Kenneth Graham
Executive Secretary and Business Manager

are *Albert Hirsch*, Philadelphia Branch; *E. M. Stevenson*, Hartford Branch; *Herbert H. Williams*, St. Louis Branch.

Messrs. *William Tucker*, Eastman Kodak Co., *B. C. Case*, Hanson-Van Winkle-Munning Co. and *R. R. Sizelove*, Frederick Gumm Chemical Co., Inc. were elected to the Research Committee, replacing others whose terms had expired. *Dr. R. M. Wick* replaced *E. T. Candee* as chairman of the research committee and *Dr. Louis Weisberg* was named chairman of the Project Directing Sub-Committee, filling the chair vacated by Dr. Wick; Mr. Candee was named vice-chairman with Dr. Weisberg.

Second Vice-President Logozzo awarded the branch exhibit prizes at the banquet on Thursday evening; Grand Rapids won first prize, Toledo second, and Bridgeport third. Awards for individual exhibits were given as follows: 1st prize, *A. T. Leonard*, Superior Plating Co., Minneapolis, Minn.; 2nd prize, *Bert Hugo*, Silver City Glass Co., Meridan, Conn.; 3rd prize, *Phillip Brod*, Detroit Lubricator Co., Detroit, Mich. After presentation of the prizes a rising vote of thanks was given to *H. Head* and *E. Berry* for their excellent effort in arranging the Industrial Finishing Exposition. The evening was concluded with an excellent program of entertainment and dancing.

The entire membership gave credit for the success of the Convention and Exposition to the members of the various committees of the Detroit Branch of the A. E. S., who arranged the entire program.

International Fellowship Club

Robert W. Renton
Chairman

MAJOR activities of the International Fellowship Club at the American Electroplaters' Society annual convention in Detroit consisted of Monday luncheon and business meeting, open house in the Grand Ballroom of the Statler, and the golf tournament on Tuesday afternoon at the Western Golf Club.

T. A. Trumbour
Permanent Secretary

Membership in the International Fellowship Club is limited to suppliers and their representatives to the metal finishing field; no dues or assessments are made and the annual meeting is held once each year during the A.E.S. Convention.

W. Douglas MacDermid, the chairman, conducted the luncheon-meeting in able parliamentary fashion. Attendance records were shattered when 134 members reported. Each individual stood, announced his name, affiliation and city after luncheon was finished as the first official function of the meeting under the guidance of Mr. MacDermid. Thereupon the chairman announced the guest speaker, said to be a renowned nuclear physicist brought to the meeting from Lake Success at great expense and inconvenience, whose subject was the connection of electrochemistry to nuclear fission. It was soon apparent that the speaker was a paid entertainer, Pete Mack, as his technical references ended in confusion. His short talk was most entertainingly received by the members, particularly in view of the serious manner in which Mr. MacDermid introduced him. Later Mr. Mack told the membership some of the hoaxes in which he had participated in the past.

Election of officers followed the guest speaker. *Robert W. Renton* was elected chairman, *Louis M. Hague* first vice-chairman, *Rudy Hazucha* second vice-chairman, *George Nankervis* third vice-chairman and *Tom Trumbour*, permanent secretary.

A present was voted Tom Trumbour, who has been permanent secretary since the club's inception for his excellent work.

Open House in the Grand Ballroom was attended by over 1200 guests, making it the largest party in the history of the club. Fifteen $25 government war bonds were awarded to individuals who had registered for the convention. The evening started at eight-thirty and ended at one o'clock, during which time dancing, refreshments and a light luncheon were served.

Louis M. Hague
First Vice-Chairman

Fifty-five persons attended the golf tournament held at spacious Western Golf Club. The tournament was a huge success under the chairmanship of Joe. Duffy.

W. Douglas MacDermid
Past President

Detroit Industrial Finishing Exposition Displays Latest Methods and Equipment

WITH approximately 35,000 visitors at the Industrial Finishing Exposition in Detroit during the five day period from June 23 to 27 viewing the various exhibits, the Detroit Branch of the American Electroplaters' Society gave the metal finishing field the largest and most complete display of products the world has ever seen. Visitors included finishing executives from Sweden, Hungary, Australia, Germany, England, North and South America, as well as everyone in this country who had any interest whatever in surface preparation and treatment.

Mr. George L. Nankervis, general chairman of the Convention and Exposition, stated that the Exposition was a complete success from the point of view of the exhibitors.

According to *Herberth E. Head* and *Edward F. Berry*, exhibits co-chairmen and the two men largely responsible for the success of the Exposition, the interest expressed by visitors in the 150 exhibits was the most gratifying part of the work. Exhibitors stated that judging from the number of inquiries received, the vast majority of visitors were executives interested not only in viewing a cross-section of the finishing industry, but bent on buying new equipments and materials.

George L. Nankervis
General Chairman

The overwhelming success of the Exposition ranks it among the first ten trade shows held in the United States this year. Detroit of course, with its huge Convention Hall, is one of the few places in the country where such large crowds and exhibits could be easily handled. The Exposition proved that metallic surface preparation and treatment has really become big business.

The exhibits covered every phase of equipment and supplies used in metal finishing. Many displays were set up by contract shops which showed finished products as well as the various stages required to obtain the finish. One of Detroit's contract shops gave away over 11,000 small plated skillets as souveniers. Oftentimes lines reached half the width of the hall with people waiting to receive their skillet.

Suppliers displayed a variety of automatic plating machines, all in operation. One showed a large barrel-type full automatic unit for cleaning and plating nuts, bolts and small parts in quantity. Another had not only an elevator-type full automatic on the floor, but a complete still tank setup in full operation with an operator doing actual rack plating. Semi-automatic units had their share of attention. One exhibitor had visitors try their hand at racking thimbles on a semi-automatic unit which had a speed adjuster.

Rectifier and motor-generator power sources were the object of much inquiry. Many motor-generators were in full operation, showing visitors actual power take-off conditions. Rectifier manufacturers were busily engaged in explaining the functioning of their equipment. One unique rectifier was displayed showing a tube type unit, in

H. E. Head
Co-Chairmen, Exposition Exhibits

E. F. Berry
Committee

which a hollow nickel tube is plated with selenium upon which is thence sprayed an electrode coating and a copper jacket then assembled on the whole as a power takeoff. The tube is water cooled; this unit is one of the interesting departures from standard design.

Various types of buffs and buffing compounds were prominently shown. Polishing lathes were in full operation demonstrating the action on various metals of different buffs and compounds. The exhibitors of polishing lathes, backstand idlers and belt type sanding equipment had complete equipments in operation. Abrasive belts attracted much attention; one manufacturer had actual production processes in operation.

An interesting exhibit had in part a mural of the largest automatic plating plant in the world, showing the equipment in operation. The same exhibitor gave away a self-charging portable radio each day to any who cared to register.

Another unique display was that of a portable air wash exhaust system for plating tanks, especially chromium. Here the fumes are exhausted directly into an air wash system, eliminating the necessity of exhausting the fume-laden air outside.

Filtration manufacturers were well represented. Here filtration units were in operation illustrating the techniques involved. Air agitation of solutions showing small scale operations in a transparent tank attracted much attention.

Chromium plating equipment was displayed prominently. One display showed a barrel for chromium plating small parts in quantity and which was very popular among the visiting executives.

Lacquers for both plating room use and standard organic finshing systems were shown by several manufacturers. Various brilliantly colored parts which had been given organic finishes were very popular. Inasmuch as the Exposition was designed not only for metallic coating field but also for those interested in organic coatings, many visitors came with that purpose in mind.

One unique exhibit by a cleaner manufacturer showed the equipment and materials used in cleaning by burnishing methods large quantities of pennies. Other cleaner suppliers were busy explaining cycles and materials for the various types of cleaning processes.

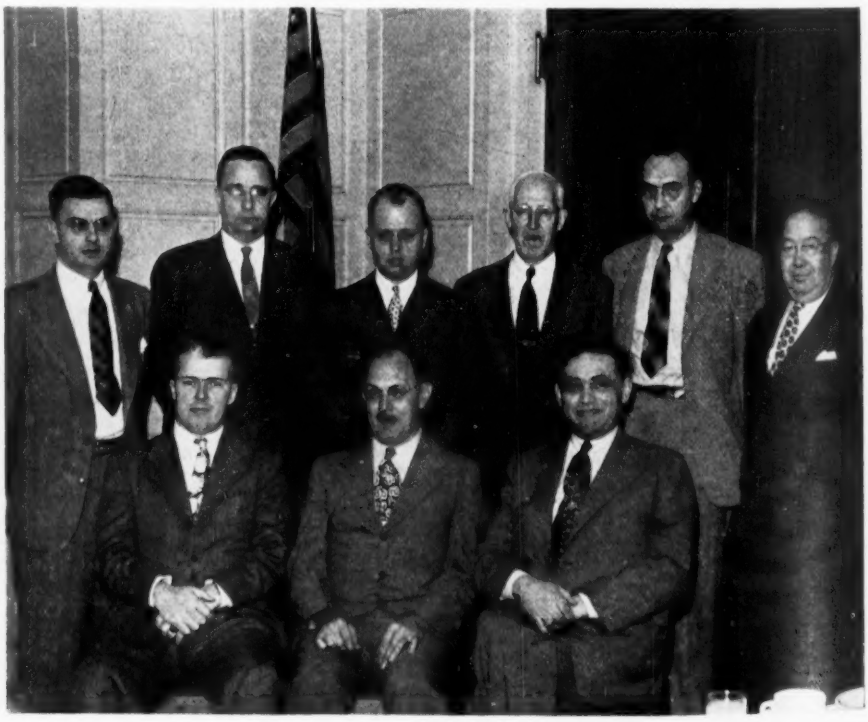
Chemical and plating salt manufacturers were well represented. One prominent display showed electroformed phonograph record dies in various stages of copper and nickel plating. Another large display showed a multitude of parts which had been nickel plated, covering the entire field of automotive, appliance and general purpose applications.

One of the most unique features of the show was a display by a prominent manufacturer of automotive parts in which a puppet show was given several times daily. A singing program was given in conjunction with puppets and large crowds attended each performance.

Tumbling, deburring and finishing equipment by rotary methods was covered by displays of several manufacturers. One unique unit which was quite a departure from standard design consisted of a large mouth tumbler which could be adjusted to any position from the vertical to the horizontal while it was rotating and which utilized either wet or dry methods.

Because many suppliers handle the entire line of plating equipment, chemicals and materials, a great many exhibits had a diversity of products on display. The necessary materials for complete plating plants of any capacity could be seen in many general supply-house booths.

Although it was originally planned to keep the Exposition doors open from 1:00 P.M. until 10:00 P.M. for only three days, operating the remaining two days from 1:00 P.M. until only 6:00 P.M., the large number of visitors attending the show could not be accommodated. Accordingly, Convention Hall remained open until 10:00 P.M. each night for the entire five-day period of the Exposition.



Research committee of the American Electroplaters' Society, 1946-7. Seated, front row: M. R. Caldwell, vice-chairman; Dr. W. A. Wesley; C. E. Heussner. Standing, rear row: Dr. R. A. Schaeffer; Dr. R. M. Wick; E. T. Candee, chairman; Dr. William Blum; Dr. H. L. Kellner; Dr. Louis Weisberg.

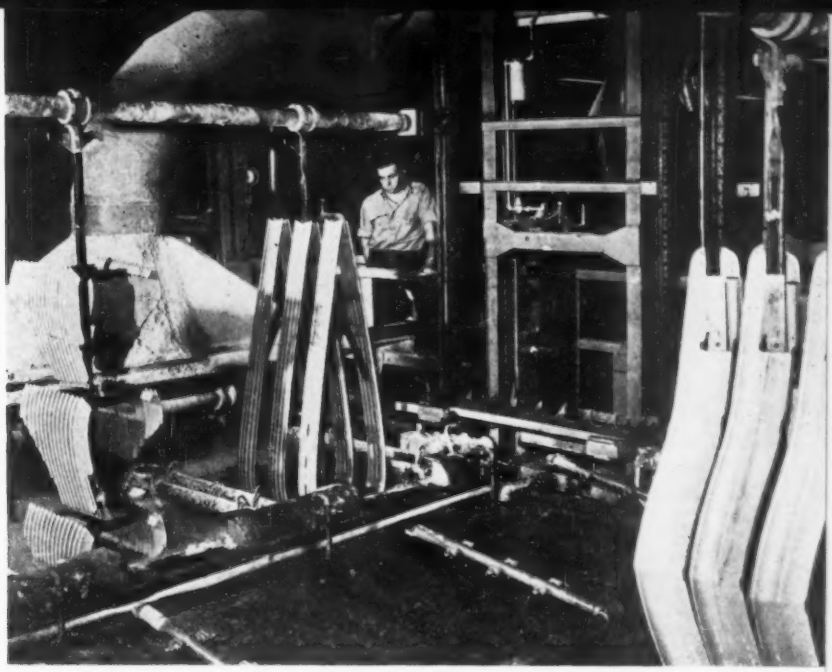


Figure 1. View from catwalk showing cleaning and rinsing cycle.

Largest Automatic Plating Plant in the World

A MODERN fully automatic plating plant 660 feet long and 50 feet wide, three-quarters of an acre of continuous plating machines was completed in the record time of eleven months for one of the largest manufacturers of automobiles. The plating machines consist of three sections for copper, nickel, and chrome. The three sections together with supplementary equipment are considered to be the greatest plating unit in the world.

The first section for copper plating is 207 feet long, includes fifteen automatic operations requiring 52 minutes to complete the cycle. The main copper plating tank contains 58,000 gallons of copper plating solution, which is circulating constantly at the rate of 1500 gallons per minute and is filtered at the rate of 1260 gallons per minute. The circulating system passes through sixteen heat exchangers maintaining a constant predetermined temperature. By means of the pump equipment the entire content of the copper plating tank of 58,000 gallons can be transferred to an adjacent storage tank in 25 minutes.

The nickel section, which is 250 feet long, includes fourteen different tanks and operations, requiring

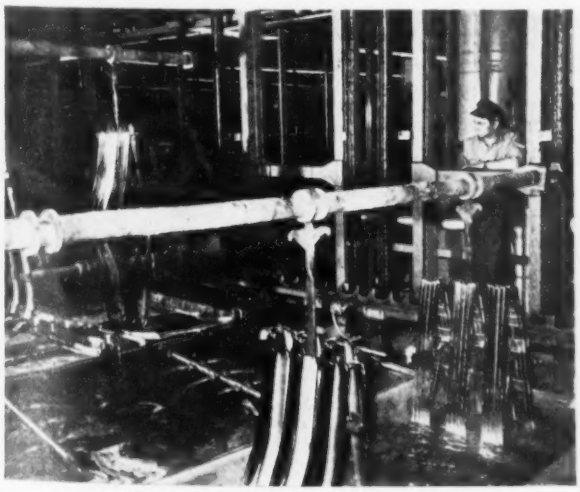


Figure 2. Parts from cleaner and rinse tanks prior to plating.

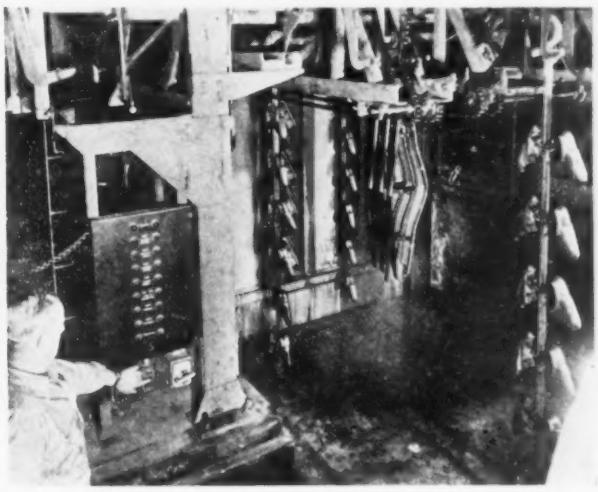


Figure 3. Master panel of the copper plating section.

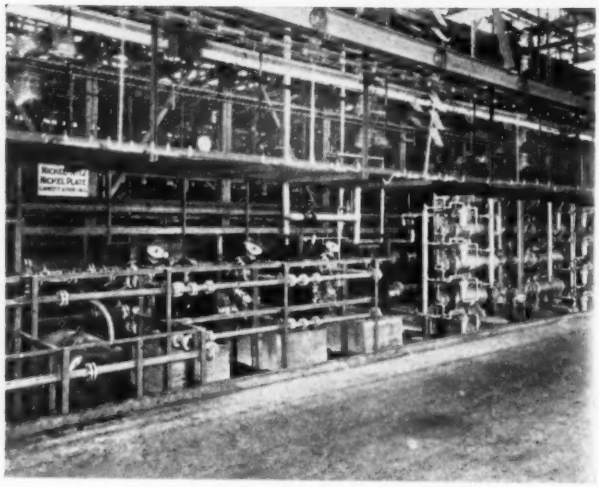


Figure 4. View showing filters and heat exchangers.

64 minutes for a complete cycle. The nickel plating tank contains 67,200 gallons of solution which is the equivalent of 8½ tank cars. The nickel plating solution is filtered constantly and heated with 15 heat exchangers. Part of the nickel solution being circulated is passed through an electrolytic purification tank which is connected to a 2000 ampere, 6 volt rectifier.

The chrome plating section is 139 feet long and includes ten automatic operations. The main chrome tank, having a capacity of 15,700 gallons, is divided into two compartments, allowing two lanes of work which may be operated at different cathode current densities. The chrome plating solution is circulated through both heat exchangers and coolers to maintain the predetermined temperature.

There is a master panel at the starting end of each automatic machine. If the machine is stopped for any reason a trouble light at the master panel indicates at what point and the machine cannot be started again until the trouble light is off and a warning horn has sounded for at least thirty seconds. In addition to this master panel there is a stop cord available the entire length of the automatic machines.

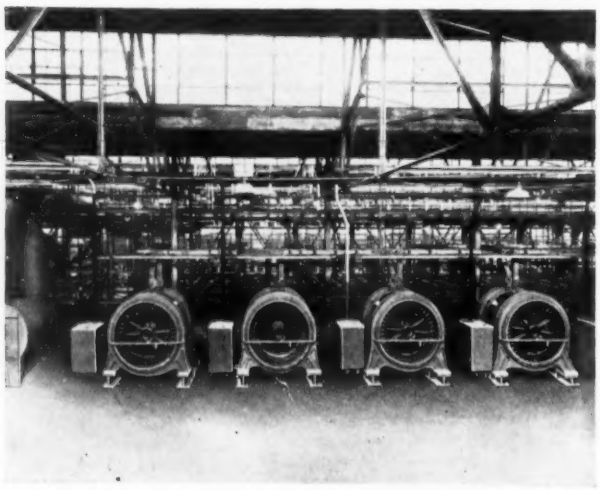


Figure 5. Four of the twenty-two motor-generator sets which supply a total of 285,000 amperes.

The plating capacity of these automatic plating machines is 22,500 square feet of copper, nickel and chrome—a total area of 67,500 square feet or about an acre and a half of plated surface per eight-hour day.

The electrical energy for the plating procedures is supplied from twenty-two motor-generator sets ranging in size from 5000 amperes at 6 volts to 15,000 amperes at 12 volts with a total capacity of 285,000 amperes, which if converted to proper voltage would be sufficient electric power for 7,000 homes.

Demineralizers with capacity of three-thousand gallons an hour furnish water for the plating tanks and the rinses preceding the plating. The temperatures of the heated solutions and levels on all plating tanks, cleaner tanks, and power wash machines are automatically maintained. All rinse sprays operate intermittently as the work is being raised from the tank by means of remote control switches, relays, and timers.

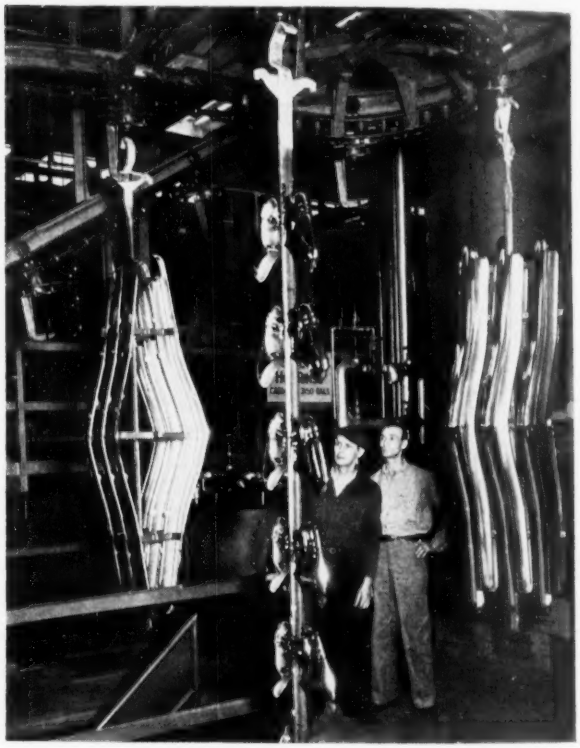
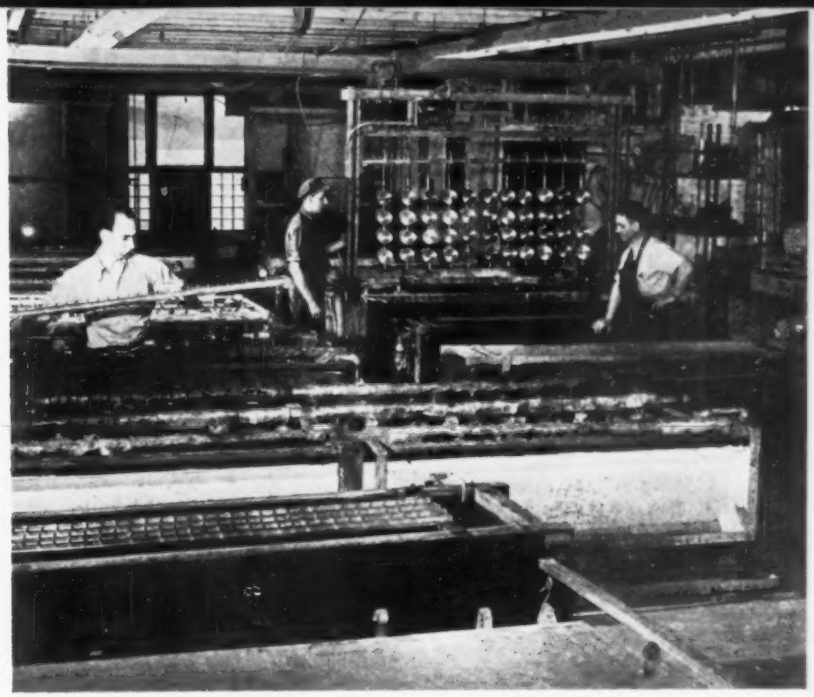


Figure 6. Transfer station from one cycle to cycle. Note size of rack compared to operators.

The total capacity of all the tanks on this project is in excess of 500,000 gallons or fifty-five tank cars of solution. Ventilation of all the tanks requiring it, is assured by thirty-two blowers with a total capacity of 434,000 cubic feet per minute.

In the total construction of this greatest of all plating plants, 8,600 tons of dirt were excavated for the pit and 4,200 tons of concrete and 92 tons of reinforcing steel were required for the 19,000 square feet of finished concrete surface. There are 400 tons of structural steel in the automatic equipment, 600 tons of steel in the tanks and 90 tons of sheet metal in the exhaust system.



General view of shop, showing tanks, workrods and hoist.

Engineering a Small Job-Plating Shop

By A. Lakos, C.E., E.E., *Owner, Quality Plating Co., Brooklyn, N. Y.*

THE job-plater in search of increased efficiency is in a difficult position because the work he handles comes in small lots and in a variety of shapes and sizes. The cost of plating is often the biggest item in his customer's production costs and this customer may be competing with larger producers who can avail themselves of the economies of mass production. So this is the problem: how to have big shop efficiency in a small shop.

With that problem the mechanically minded owner of a job-plating shop has a fascinating occupation. He will have occasion to advise his customers on slight changes in design or production procedures with a view to effecting economies in plating. He will be able to design various chucks and holders for polishing the work and miscellaneous racks for plating, not forgetting the maintenance of machinery. Every new job is a new problem, and there are few dull moments in the life of the plater who has an inventive mind and likes to tinker with tools.

The writer of this article had the good fortune to learn the plating business from the bottom up, after accumulating a variety of engineering experience as a test engineer with a large electrical manufacturer and an installation engineer with another. Upon losing the last named job in the early depression, a job in a plating shop as a wire boy was found and more engineering has been done by the writer in the job plating business than when a small cog in a big machine with the title of "Engineer."

Later a job-shop was purchased on the top floor of an old loft building. The shop was laid out with the same ingenuity and thought as that used by a housewife when she arranges her living room; the copper, nickel, chrome, tanks were placed all over the lot, festooned with pipes and bus bars. After the first excitement wore off, all the inefficiency in handling the work became apparent, just as the ups and downs of the plater, carrying the work from tank to tank, began to bother his feet. For the greater part of the war the writer had to run the chrome tank himself, and it was painfully realized that if you don't use your head you have to use your feet, and still don't get very far.

With this situation ideas kept cropping up. The first resolve was to have a single level working platform in the next shop. (This had been done before, but by few job-platers.) Then thought was given to find a way of putting larger quantities of work in the tanks in one load and eventually the idea of arranging removable workrods resting on contact surfaces in the tanks, instead of the customary fixed workrods, was developed. The idea was to pick up and lower these workrods with the work on them by means of a hoist.

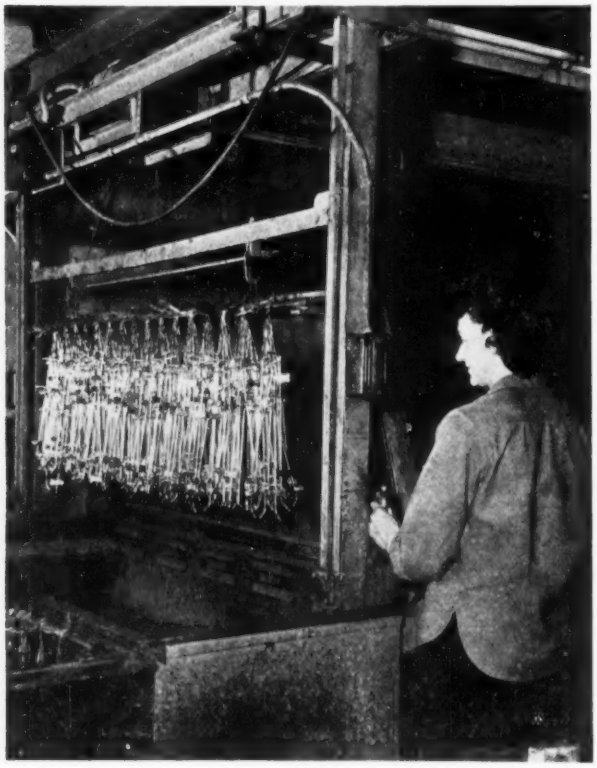
In 1945, an ideal building for a small plating shop was found. Originally it was built to be a stable for a brewery, over sixty years ago, but the walls, ceiling beams and roof are just as sound as the day when the building was put up, and if the architect had intentionally laid out the building for a plating shop, (although he probably never heard of such animal in those days) he could not have done a better job. There is a 13 ft. ceiling and in the 4400 sq ft. L shaped ground floor area there is a column-free space of

30x100 ft., and the 500 sq. ft. smaller leg of the L. separated now from the plating room by means of a glass partition, forms an ideal polishing room, with light and air from three sides. In the first plating shop the plating room was a hopeless mess on account of the buff dirt and dust raised by the polishing lathes.

The pictures tell the story. The tanks (19 of them) are arranged in two parallel rows, with a 3 ft. center aisle between them. The tanks are all 7 ft. long, and although their depth varies from 42″ to 48″, they are all installed with the top edges at the same level, 60″ from the floor. The platform is 28″ high, and all the pipes, drains and busbars are concealed under this platform.

A special hoist was built to carry the workrods from tank to tank. It raises and lowers the 6′-8″ workrods with up to a 200-pound load on them. The hoist is approximately 7 ft. long, and is mounted on an 18 ft. long bridge which travels over a 56 ft. span, thus servicing all tanks. To sum up its usefulness, on certain work such as heavy castings, production in the plating room four and five-fold is increased.

For light work the hoist is not used but the removable workrods are handled in a different way. The operator hangs the wired work on the workrods in the last rinse and then picks up the whole business by hand and places it in the plating tanks. This way he eliminates the bugaboo of the plater: oxidization while hanging the work in the tank since this operation is performed in clear running water where there is little chance of air attacking the work. Incidentally, five rinse tanks are used and while the water bill is about $20.00 a week, it is well worth it because the work is really clean when it goes into the plating tanks.



Work being removed from the dryer by means of hoist. One work wiring operation was required for the entire copper, nickel and chromium cycle, including rinses.

Portable workrod being removed by hand from chromium plating tank.

The workrods with wired work on them are moved from the bright nickel tanks to the chrome tank, with a rinse between. Six positions in two nickel tanks allow the work to stay in the nickel for 8 minutes and about 80 seconds in the chrome, thus keeping the workrods rotating.

After chrome-plating, pressure rinse with a quick-opening valve and drying of the work with hot air is used. Many of these contraptions were doped out and made up locally. For example, as a dryer, a light gage wall tank, 84″ x 30″ x 42″ deep, with a counter-balanced hinged cover which operates a limit switch, which in turn starts and stops a 600 cfm. blower was installed. The air from the blower passes over steam coils on the bottom of the dryer; the work stays in the hot air blast for 5 minutes and most of it thus does not require chrome coloring.

All this is very simple now. Lest any brother plater should get the idea that it always was so, it should be put into the record that there were days and nights of despair when only the loyal cooperation of the finest gang any boss ever was blessed with overcame all the obstacles and difficulties encountered in setting up the new plant. The story of a few particularly insidious difficulties might be worth telling.

All solutions (approximately 5000 gallons) are heated by means of submerged steam coils which are joined to nipples welded into the tank walls by means of ground-joint unions. These connections were carefully tested before making up the solutions, but when

(*Concluded on page 89*)

Metal Surfacing by Hard Chromium Plating

By Edwin H. Halvorsen, *Cro-Micron Process & Research Corp., Newark 2, N. J.*

THE electrolytic deposit of chromium is, of course, not a new process—in fact, it dates back to 1838, when Junot first deposited chromium on a base metal. However, Bunsen is given the credit for having first electro-deposited chromium (about 1854) although Geuther was apparently the first (1894) to accomplish this from chromic acid baths, to which were added various other acids, including sulphuric. In 1905, in their work at Cornell University, Carveth and Curry verified, in part, the proposals set forth by Geuther. In that year, also, Placet and Bonnet proved that chromium could be deposited from chromic acid solutions providing that a foreign acid—preferably sulphuric—was present and that a high current density was employed.

In extensive researches carried out at Cornell University under Dr. Bancroft and Dr. Carveth, a few years later, Sargent determined a considerable number of factors important in chromium plating. These included a satisfactory bath formula made up of chromic acid and chromium sulphate, suitable conditions of concentrations, current density and temperature, the function of lead anodes and the necessity for close regulation.

Following the publication of Sargent's work in 1920, interest in the process rapidly increased and, before 1923, a half dozen or more companies in the United States had development work in progress which soon led to extensive commercial practice. Thus grew the business of decorative chromium plating. And, although plating at this time was not generally applied to articles which were subjected to high pressures or shock, it did become very popular in such fields as furniture, novelties and jewelry.

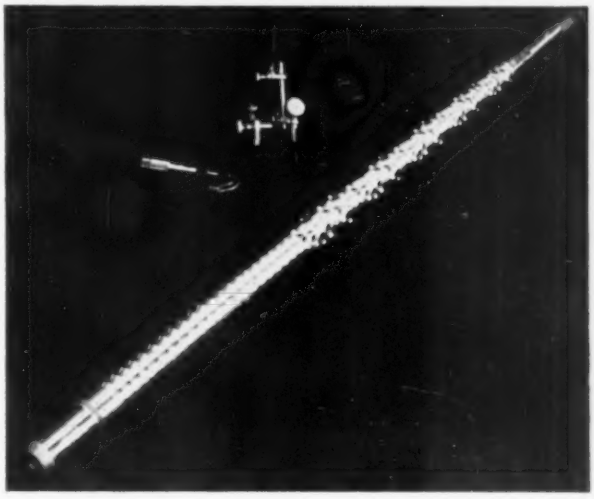
Decorative Chromium Plating

The first step in preparing base metal for decorative chromium plating is to buff it, thereby removing as much of the fragmented surface as possible. This leaves the surface polished and smooth and gives the finished coating an appealing appearance. In some cases, in place of plating chromium directly upon the metal, a coating of copper is deposited and buffed to a high polish, and the chromium is then deposited over the copper plate. This is done because of the receptiveness of copper to the succeeding deposit and also because, having a high conductivity factor, it is easier to plate on copper than on a base metal with a much lower conductivity factor.

In some cases, decorative plating is done by plating with copper, nickel and then chromium—copper for uniform deposit, nickel for reflectivity and chromium for wear. This type of plating is done a little differently than hard chromium plating. For one thing, the temperature of the bath is lower and the current density proportionately lower. This type of bath will have a ratio of chromic acid to sulphuric of 100 to 1 (in this case that would be 53 oz/gal of chromium trioxide to 0.53 oz/gal of sulphuric acid) adding water to complete one gallon—or 128 oz. for a one gallon solution. The bath temperature is 105 degrees F., and the current density, to obtain bright deposits, 115 amperes per square foot.

Hard Chromium Plating

The growth of hard chromium plating is due to the unique combination of properties of the metal deposited, which is not found in other methods of hard surfacing. In addition to being hard, electro-deposited chromium has an especially low coefficient of friction, a high resistance to seizure and, when plated to sufficient thickness, a high resistance to corrosion. The



Pull broach with roto cut teeth designed to penetrate through abrasive scale. Hard chromium plating improves life.

Reprinted from the Tool Engineer, November, 1946.

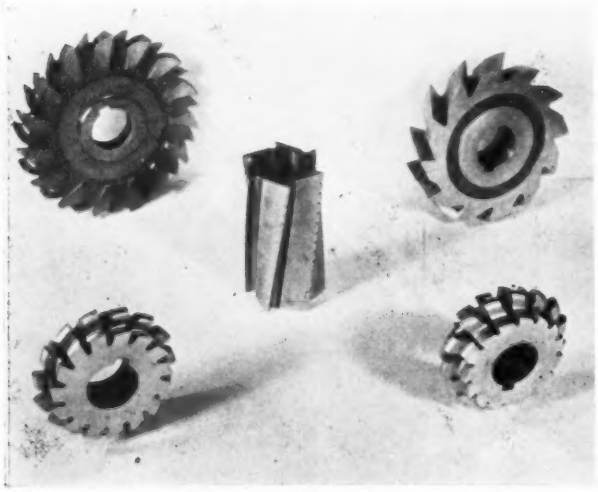
thickness of the deposit will vary, dependent upon the application of the work processed, from less than 0.0001" upwards to 0.010" or even more; however, cutting tools are mostly plated in the thinner range.

It is difficult to determine the exact hardness value for thin deposits of chromium, but the U. S. Bureau of Standards gives deposited chromium a Brinell value of between 900 and 1200. Consistent Rockwell readings have been gained from 80 and 85 "C" scale. In addition to the characteristics of deposited chromium of being slippery and having a quality of being greasy or self lubricating, some other physical properties are given here:

Density (as deposited)	6.93
Density (after annealing)	7.10 to 7.15
Melting point	1920-Deg. C., (3,488 F.)
Electrical resistivity (annealed)	13.1 to 19.3 x 10^6 ohm/cm^3
Reflecting power	60 to 66%
Coefficient of expansion (as deposited)	Negative
Coefficient of friction sliding on chromium	0.12
Coefficient of friction sliding on babbit	0.13
Coefficient of friction sliding on steel	0.16
Coefficient of friction sliding steel on steel	0.30

As explained in the previous article on this subject, the reason hard chromium plating (as applied to the surfacing of high speed cutting tools or other cutting tools which are subjected to shock or high pressures) has not advanced until recent years is that the deposited metal was quite brittle. This was caused by caged hydrogen within the metal which, when subjected to any appreciable pressure, would immediately expand and, in its effort to free itself, would break the chromium metal which housed it. This is known as peeling, spalling or chipping.

However, with the development of a heat treating process which relieves the hydrogen and allows it to slowly ooze out, leaving the plated surface free of any embrittlement, it becomes a first in metal surfacing. Before going further with hard surfacing by chromium plating, however, let us stop and examine other types of surfacing and other alloys in use today. By so doing we can better understand and evaluate the over-all picture.



War surplus material milling cutters as they appear after hard chromium surfacing.

Cemented Tungsten Carbide

The development of cemented—or sintered—tungsten carbides, for use in wire drawing dies, was of American origin; however, its use as a tool material was developed in Germany during World War I. Later (around 1922) experiments with this material as a cutting tool proved so successful that, by 1928, tungsten carbide tools began to have an important place in industry. Tungsten carbide, as the reader doubtless knows, is made by compressing powders of tungsten, carbon, and cobalt to the desired shapes.

These blocks are then sintered at a high temperature in a reducing inert atmosphere and, after this treatment, the material cannot be cast, forged or in any way heat treated. Due to the cost of tungsten carbide, only small pieces are used for tools in commercial machining operations, the tips being welded or brazed into a high carbon steel tool shank by using copper, bronze or silver as a brazing element with borax ordinarily used as a flux.

Tungsten carbide tools are limited, in application, in several ways. This, of course, does not mean that the tools are not good; it simply means that the smart engineer will be cognizant of their limitations and will not try to force them to uses for which they are not suited. Tungsten carbide tools have little elasticity, are brittle and have considerably less resistance to bending than high speed steel. They cannot be subjected to much vibration or chatter, therefore, to successfully handle the increased cutting speeds the tools permit, heavy rigid machines are required.

Due to the hardness of tungsten carbide, sharpening must be done with a special diamond wheel, or with a special bonded abrasive. The cutting edge should be finished to the highest possible degree, and great care must be exercised in sharpening. The grinding is so important that some manufacturers of carbide tools operate free schools for the shop men, giving them a practical course in the use, application and maintenance of this type of tool.

Stellite

Stellite, a non-ferrous alloy, was developed about 1915. For some work, it was found to be superior to a high speed steel tool, particularly for light continuous cuts for either steel or cast iron. It is a cast material, very hard and brittle and very resistant to abrasion. Stellite tools are tougher and cut better when cold than when hot, however, they would not be affected by heat of 1500 degrees F.

Special grades of Stellite have been subsequently marketed under the trade names of J-Metal and M2-98, the former advocated for finish cuts and the latter for rough cuts. The M2-98 is very hard and it is necessary to use a diamond wheel when sharpening the tool. Both of these alloys have proved successful in cutting material at considerably higher speeds than was possible with the original Stellite.

Tantalum and Titanium Carbide Tools

While the cemented tungsten carbides are particularly adapted for machining cast iron and non-ferrous

types of material steel parts appear to machine better with cemented carbide tools having tantalum and/or titanium added. This is because these elements impart an "oiliness" to tungsten carbide which enables the chip to slide over the tool face more easily. All of these finer grained tool materials are available in hardness up to 78 Rockwell "C," as against a hardness of only 66 Rockwell "C" which may be considered the practical limit for high speed steel.

Chromium Plated High Speed Steel Tools

The direct electrode deposition of chromium, on a high speed steel base, results in the combination of all the excellent features of the foregoing types of tools, plus the elimination of the undesirable features. The plated tool will have extreme hardness in excess of some of the aforementioned tools. Deposited chromium, upon a steel base, will have a hardness up to 85 on the Rockwell "C" scale, and will withstand heat up to 1700 degrees F. before any notable change occurs. (Cemented carbides, operating at speeds of 200 to 500 sfm, withstand a temperature of 2000 degrees F. before tool failure occurs.)

Chromium plated steel tools also have the quality of oiliness, a quality that allows easy and fast chip relief. Added to this, fine chip particles cannot weld on the cutting edges of the tool. By a special heat treatment —a rather recent development—of the plated tool, the tool plating is rendered completely free of embrittlement. Most important of all, to the tool engineer, is that *deposited chromium has a lower coefficient of friction than any other metal now known.*

Surface Finish Important

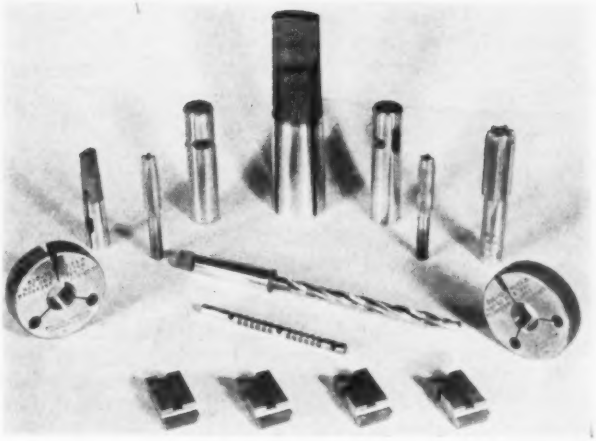
The preparation of metal surfaces, prior to deposit of hard chromium, is quite simple for all practical purposes. Essentially, it consists of properly cleaning the surface to render it completely free from any foreign particles embedded in the pores of the metal surface, and to rid it of grease, oil or wax. This is very important since chromium will not properly adhere to a dirty surface.

In this connection, we can point out that the degree of finish, put on the tool by the maker, has a considerable bearing on chrome plating. And even without chrome plating, the reduction of the fragmented surface to a minimum will aid in decreasing friction and will increase the life of the tool or part considerably. Superfinish, to use that widely accepted term, pays dividends, not only in increased production but in increased tool life.

However, to merely tell of the good points of good surface finish and of hard chromium plating is hardly the "proof of the pudding." What the reader is interested in is comparative results and these may be had only through actual cut and try. The following presents the case for both plating and finish.

Tests on Gear Shaper Cutters

The results of tests on gear shaper cutters, as shown in Tables I and II, indicate a very great increase in tool life for molybdenum high speed steel cutters used



Group of miscellaneous tools having undergone hard usage. All are shown chromium surfaced without any preparation except cleaning.

in tests conducted on Fellows gear shapers. In the test, two new gear cutters were used, one being plated with chromium to a thickness less than 0.0001 inch, and the other unplated. Cutters were identical, having specifications as follows:

Dimensional pitch	8-10
Pressure angle	20 deg.
No. of teeth	32
Tooth depth	0.225"
Base diameter	3.7551"
Type of cutter	Finishing
Cutter material	8% molybdenum steel
All (workpiece) steel used in test	NE 8447
Brinell hardness between	196 and 200

The chromium plated gear cutter was mounted on a Fellows Type 6-A Gear Shaper and the machine speed was set at 184 strokes per minute, with 1030 strokes per revolution of the cutter, and held constant throughout the test. The gear made two revolutions to remove 0.040" to 0.045" of stock over pins. This cutter finished fifteen gears of 48 teeth each, full width 1¼". The teeth on the first few gears appeared slightly rough, but became smoother as more gears were finished. All gears showed up satisfactorily on a Red-Liner chart.

The unplated cutter was then placed on the same shaper and completed the same test. Then, the plated cutter was remounted in the gear shaper to finish fifteen gears of 52 teeth each with 1¼" face width. The teeth were smooth and the gears checked well within the allowed limits on the Red Liner. The cutter was removed and found to be in good condition with the plating well intact. The cutter by this time had cut 1500 teeth.

The unplated cutter was then remounted in the gear shaper and was started cutting the same type gears as was completed by the plated cutter. The 20th gear finished—or the fifth gear in the second run—showed greater errors than allowed when checked against the master gear on the Red Liner. The cutter was removed and examination showed that one tooth had peeled back. The tool had cut a total of 1760 teeth, 1¼" face, before failure.

The plated cutter was again mounted on the shaper

TABLE I—PERFORMANCE OF PLATED AND UNPLATED GEAR SHAPER CUTTERS

Cutter No.	*Condition*	*Material Cut*	*Number of teeth cut equal to 1¼" wide*	*Ratio of performance*	*Tool After Experiment*
1	Plated	NE 8447	5056	2.88	Red Liner bad, tool not peeled but needed regrinding.
2	Unplated	NE 8447	1760	1	Peeled.
2	Plated	NE 8447	5740	2.67	Red Liner good, tool could continue to cut.
1	Unplated	NE 8447	2150	1	Peeled.

and was used to cut 22 gears of 70 teeth each. Upon examination, after this run, it was discovered that the plating had worn off the cutting edge of the tool, but the cutter was still sharp enough to use further as the base metal of the cutter had not peeled. All gears cut were within the limits of tolerance allowed. At this point, the plated tool had cut a total of 3040 teeth of 1¼" width and was not too dull for continued service.

The cutter was again mounted and used to cut 18 gears of 80 teeth each, with a tooth width of 1¾". (The 1¾" width of face on these gears was equivalent to 112 teeth of the 1¼" width). The gears were finished with two cuts of the finishing cutter at a shaper speed of 184 strokes per minute, with 1280 strokes per revolution of the cutter. The gears checked satisfactorily on the Red Liner* tester. Some of the teeth appeared rough, but were good enough to pass inspection. Upon removal, the cutter was found to be slightly dull.

Tabulating the results of the test (Table II), the plated cutter had cut the equivalent of 5056 teeth with a face width of 1¼", while the unplated cutter had only cut 1760 teeth of the same face width. Both tools were then reground. The amount of metal ground off each cutter is shown in Table I.

Same Cutters Reversed

Later, to insure an absolutely fair test, the unplated cutter was plated and the plated cutter was stripped of its plating, and another series of tests were made. These cutters were used to finish cut 50 gears with 80 teeth, 1¼" face, and 50 gears with 69 teeth, 1½" face. Steel used in these tests was NE 8447, having a Brinell hardness of 202 to 215. The same machine was used as in the previous test and the speeds employed were 184 cutter strokes per minute, with 1080 strokes per revolution of the cutter. (Standard strokes for this machine call for 1260 strokes per minute.) The gears made two revolutions to remove 0.050" to 0.080" of stock over pins.

The plated cutter (which in the first test was the unplated cutter) was mounted and finished cutting 50 of the 80-tooth gears and 21 of the 69-tooth gears without the Red Liner showing any rough teeth. At this point, the plated cutter had cut 4000 1¼" teeth and 1449 1½" teeth. This was equal to 5740 teeth of 1¼" face width. At this point the plated cutter was removed and found to be slightly dull.

The unplated cuter (the one from which the plating had been stripped) was mounted on the machine and used until the Red Liner chart showed the teeth to be rough. The job was to finish the remaining 69-tooth gears, of which there were 29. For the first 23, the test showed a smooth line, but the 24th gear indicated roughness. However, the gear passed inspection. The chart on the 26th gear was very rough and beyond the limits of allowable error. The unplated cutter had cut 1794 teeth of 1½" width, equivalent to 2150 teeth of 1¼" width. Upon examining this cutter, it was found that one tooth had peeled back slightly. Both tools were sent to grinding for sharpening. The relative performance of the two gear cutters, both plated and unplated, is correlated in Table II.

A testing laboratory, which does considerable testing and research of new materials and processes, ran experiments on three commercial tool bits. The tests were made on both types of bits under as nearly similar conditions as was possible. So that time of test could be held at minimum, no coolant was used. Furthermore, cutting speed was progressively increased until the cutting edge failed.

Two tests were made with each type tool bit. The unplated commercial tool bit "A" that was used in the first test chipped at the start of the cut. This tool was sharpened and used again. In the second test the unplated commercial tool bit "A" also chipped at the end of one length of cut. This bit was set aside and a new one used in the next test.

* Red Liner Gear Testing Equipment, by The Fellows Gear Shaper Company.

TABLE II—METAL GROUND OFF IN SHARPENING GEAR SHAPER CUTTERS

Cutter	*Cutter width before grind*	*Cutter width after grind*	*Metal removed by grind*	*No. of teeth equiv. to 1¼ tooth width*	*Teeth per .001" gr.*	*Ratio of performance*
Unplated	0.8555"	0.7605"	0.095"	1760	18.53	1
Plated	0.9035"	0.8940"	0.0095"	5056	532.22	28 to 1

TABLE III—PERFORMANCE DATA ON FORMING TOOLS

Tool No.	*Type of Tool*	*Brand*	*Condition*	*No. of Cuts*
1	Grooving form tool		Unplated	675
			Plated	1020
			Plated and reground without removing plating	1065
2	Grooving form tool	Trojan	Unplated	400
			Plated	1220
			Plated and reground without removing plating	985
3	Rib form tool	Rex AA	Unplated	230
			Plated	925
			Plated and reground without removing plating	400
4	Rib form tool	Trojan	Unplated	17
			Plated	312
			Plated and reground without removing plating	221
5	Grooving form tool	Spartan	Unplated	77
			Plated	312
			Plated and reground without removing plating	221

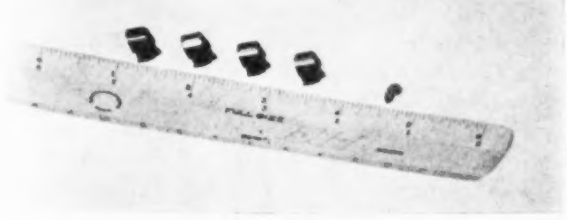
Before certain cuts were made, the test piece was heated to about 125 degrees F. to keep the temperature of the steel about the same for both tool bits while cutting. Steel rounds were used in the test, but each test employed a steel of a different hardness. Table III shows the results of tests made with forming tools plated against unplated.

Tests were also run using plain carbon steel twist drills, plated, and the results correlated in chart Table IV. It appears that, in some instances, chromium plated plain carbon steel tools can replace (or be a substitute for) high speed tools.

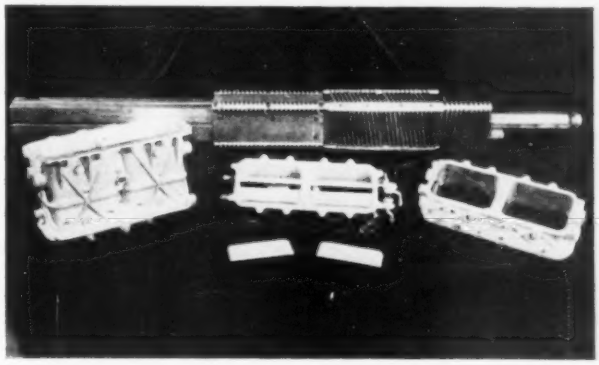
It is most apparent, from information gathered through these tests, that metal surfacing by hard chromium plating reduces the chip friction together with a reduction of spindle torque. The plated tools are cutting with less horsepower than standard high speed steel tools. This is indicated by the different nature of the chips and improved finish cut.

TABLE IV—PERFORMANCE OF PLATED AND UNPLATED ½" CARBON TWIST DRILLS

Condition	*Plated as received*	*Number of cuts made after 1st Gr.*	*2nd Gr.*	*3rd Gr.*	*Total No. of cuts*
Plated	163	156	166	159	644
Unplated	48	120	37	42	247



Tools shown against a six inch pocket rule. Tolerance is held to 0.00001" and cutters were checked by comparator before and after plating. The chromium surfacing did not affect the tolerances in any way.

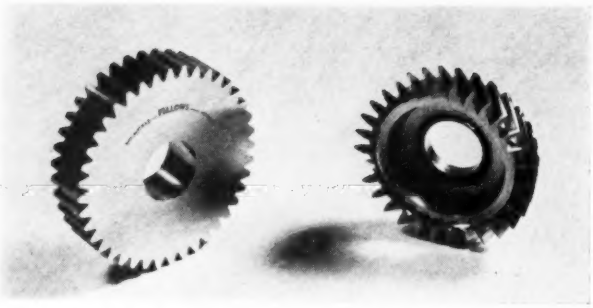


A compound broach, 4" x 6", used to finish holes in a carburetor housing. Hard chromium surfaces provide easier chip relief with reduced clogging and increased working life.

The results of the tests recorded here indicate that metal surfacing by hard chromium plating not only increases the life of cutting tools, but also permits faster machining operations and heavier feeds.

The chromium surfacing increases the hardness of the tool bearing surfaces, the inherent "oiliness" of the deposited chrome prevents galling and building up of cuttings or drillings, and the low coefficient of friction of chromium reduces heating of the tool, with its consequent annealing effect on the tool while in operation. It has been found that even though the plating has been worn through in a tool, the remaining life of the tool is often higher than one which has not been plated. This is probably accounted for by the plating process having a chromizing action as well as a plating action on the tool.

In addition to the advantages brought out here in these various tests on cutting tools, there is also the value in the chromium surfacing of such items as



Master gear and helical gear cutter. Surfacing of such tools by hard chromium adds considerably to their accuracy and durability.

pneumatic drills, and hammers, and pumps and liners, deep well drills, forming dies, and so on ad infinitum through the gamut of tools and machine parts.

Recently, a New Jersey manufacturer submitted some drawing dies, used for forming stainless steel, with the report that they had to be refinished after runs of 50 to 100 pieces. After these dies were plated as received, the manufacturer reported that he was able to get 9,000 pieces before the dies had to be refinished. Examination, at that point, showed the chromium to be worn, but the underlying surface was but slightly damaged. They were stripped of the old remaining chromium, replated and put back into service.

Before plating, the dies had a hardness of 48 Rockwell "C." No check was taken after plating, since it is difficult to get an accurate reading, on chromium plating, with the average Rockwell machine where the kilogram load is so heavy (150). However, a fairly accurate reading can be had with the Knoop Indenter, but even this is a bit too heavy a load for measuring thin chromium surfaces. It may be an interesting note, in this connection, that drawing dies hardened to 64-65 Rockwell "C" do not do as well, after chromium plating, as they do when the original hardness, before plating, is from 48 to 57 Rockwell "C."

Misconceptions of Chromium Surfacing

Because many engineers are not familiar with chromium surfacing, they labor under misconceptions as to what it can or cannot accomplish. For one for one thing, it will not make rough surfaces into superfinished surfaces. Chromium deposited upon a surface will only reproduce that which it has to begin with. One cannot expect to send out inferior tools to be plated and expect that, when plated, they will be equivalent to a high grade tool. The poor tool will probably show an increase in life, but will never give results equal to the surfacing of a good tool.

Quite often, manufacturers express a desire to have samples processed so that they may conduct tests in their own plants. Sometimes reports come back that their own unplated tools showed up better than the plated ones. Investigation of many of these cases, however, has disclosed: (1) that the tools were improperly ground; (2) a lack of knowledge of operation, and (3) inexperience in conducting comparative performance test.

For example, a manufacturer will send in a number of twist drills to be processed, and will then conduct very careful tests. In doing so, however, he may have failed to conduct a test for uniform performance of a comparable number of unplated drills, and therefore does not have concrete data upon which to correlate final results. As a matter of fact, unplated twist drills do not perform uniformly, although the differences have never been so great that the user could rightly complain to the supplier.

But, in making exacting tests of plated drills, he discovers the inconsistencies and, taking the path of least mental resistance, immediately blames the chromium plating. This condition is not at all confined to twist drills, which have merely been used as an easier example since they will not entail details to fully clarify the case. Nearly all reliable twist drills, when plated, show an increase in tool life up to 2,000 per cent.

That this thought and experience may not be one sided, the writer discussed this matter with several representative cutting tool manufacturers. They, too, have experienced difficulty with the shops using their tools, in that production personnel lacks the knowledge of proper usage of tools. As with the self taught golfer, who has developed his own way of playing, the results are far from satisfactory. In this connection, it can be said that reputable cutting tool manufacturers—and they are in the majority—take full advantage of good surface finishing and do everything possible to produce tools that compare with the best used in modern production.

Tests on chromium plated barrels of machine guns and on chromium plated bullets during the late war indicated a considerably increased muzzle velocity, greater accuracy and longer barrel life as compared to unplated. For peacetime application of this plating procedure, we can look to the sportsman and his pet rifle or side arms. By chromium plating the inside of the barrel, he saves the time and worry of cleaning and preserving it before he puts it up or makes ready for his next sporting event.

The inside of plated barrels do not have to be cleaned, and under the protection of hard chromium they will give long accurate use. After the chromium has become thin, the barrel can be stripped of the old chromium surface and refinished. The gun barrel is then as good as the day it was purchased.

In conclusion, the writer has tried to bring to the attention of those interested in engineering advancement the great possibilities of hard chromium surfacing, both in everyday shop work, and in the important job of meeting production schedules. Until such time as new metals or processes are discovered, chromium surfaced tools and machine parts will, in the writer's belief, continue to lead the field.

All Our Yesterdays—Part VI

By George Spelvin

COMING events cast their shadows before, and two news-items that appeared in January, 1908, might have warned the bibulous that the era of legal potations was drawing to a close: state-wide prohibition went into effect in Georgia and was enacted in North Carolina. The Demon Nicotine was in for it, too; a city ordinance outlawed smoking by women in public places in New York City. The tide rolled on, as during the year prohibition was adopted in Mississippi and Alabama. The first Hudson tunnel linking New York and New Jersey and the East River tunnel from New York to Brooklyn was opened. A theater fire in Pennsylvania claimed two hundred dead. The Supreme Court handed down its famous decision in the Danbury Hatters case, holding that labor unions came under the anti-trust laws. Thus opened the presidential year of 1908.

It was a time for stock-taking for the electroplaters. The leading article in the January issue of one of the trade journals carried the rather cumbersome title "Lines Along Which Electroplating Is Advancing." "The past three years have shown a great advance," said the author, "particularly has there been a great expansion in the size of plants. Although the largest plants are in the East, the West is catching up. Some of the biggest plants use daily as much as 15,000 to 20,000 amperes. The industry as a whole has progressed in the quality and variety of the finishes it offers, while at the same time reducing their cost. The modern electroplating plant is in charge of trained engineers who look after the motive power, generators, economical distribution of the current, etc., while the active operations are in the hands of men fully equipped with chemical as well as practical knowledge of the art." Surely a Utopian picture: one could wish this were true in 1947. "The trend of all improvement has been entirely along mechanical lines," in generators "a few years ago 5000 ampere generators were a rarity whereas now they are common. There has been a large number of patents on mechanical plating and finishing machines, some of which will never be used," the author continues, "but the trend is definitely toward automatic equipment." And finally, the commercial: "Among the simpler and more efficient machines on the market is the apparatus made by a plating supply firm in Newark, N. J., with whom I am connected."

Both leading trade journals commented editorially, as was customary, on progress during 1907. It was remarked that "Nothing strictly new has developed in the plating trade during the year, although some processes are receiving more attention than formerly. Polychrome plating is in vogue just now and in many instances the rage is running mad. While the most beautiful effects can be obtained it would be well if the plater would remember that colors cannot be mixed in the most promiscuous fashion in wild profusion without hurting business. Garrish (*sic*) effects are never pleasing and the sooner they are cast aside the better for all concerned." The plater is gently advised to observe the flowers, which though brightly colored always observe a natural law of color harmony. "Some little attention has been paid to the metallization of non-conducting bodies such as leaves, flowers and the like, and most beautiful specimens have been produced. Work of this kind would undoubtedly find a ready sale and since the processes are well known it seems strange that more of it is not done."

Readers of a competitive paper would have gotten a somewhat different slant; it was agreed that 1907 progress was largely in the field of mechanical contraptions. Other trends noted were that the old and formerly lucrative job-plating business of replating silver-plated flatware was rapidly falling off and this was attributable to the cheapness of new ware. (And yet a feature article, later in the year, told in detail how to replate old flatware.) The Ormolu finish was on the wane; the public was tired of it. (And yet a feature article told in detail how to produce the Ormolu finish.) The value of boracic acid in nickel plating "is now fully appreciated, and the use of nickel carbonate for correcting acidity is standard and has

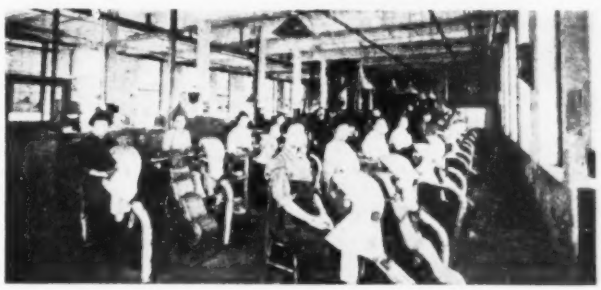


Figure 1. A modern polishing room (1908). Note all women operators.

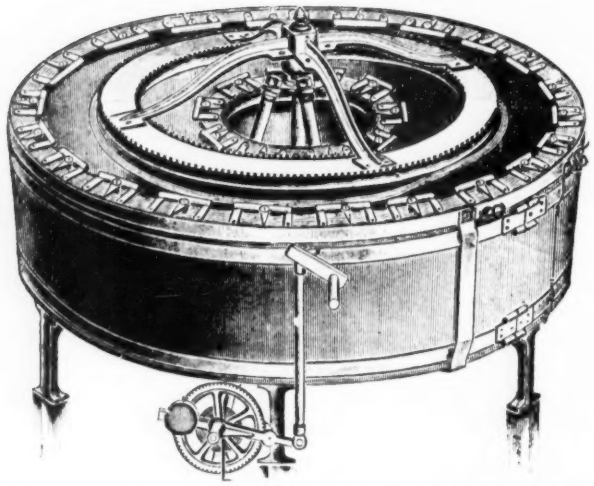


Figure 2. Circular frame plating tank. One of the earlier forms of the semi-automatic plating machine.

replaced ammonia." No changes are noted in silver-plating, but electrogalvanizing is extensively used and is "here to stay. For many classes of work it is superior to dip galvanizing, and while it does not give as good a protection it has a smooth finish of a white color."

An article explains how to obtain uniform thicknesses in nickel plating: wire the anodes at the bottom instead of the top. (You will have to read this article for yourself, and if you understand it, explain it to me.) A Dictionary of Chemical and Commercial Names of chemicals used in electroplating has some interest: for the modern plater—or for that matter the modern technologist in all fields—can be thankful that the jargon of unscientific so-called trade names of chemicals is gradually disappearing. But in 1908, apparently, acetic acid might be called acetulic acid or hydric acetate; the author of the compilation unfortunately confuses glacial acetic acid with acetic anhydride. If you wanted benzoic acid you could order flowers of benjamin, and it seems that roach alum was the same thing as Roman alum, if that means anything to you. Crystallized verdigris was merely copper acetate, and salt of tartar only potassium carbonate. But my favorite, by a wide margin, is a compound known, simply and majestically, as Wonderful Salt. Just sodium sulfate.

A new electrocleaning compound is announced, which will clean not only ferrous metals but tin, britannia, copper, zinc, brass, and bronzes. "While there is some diversity of opinion in regard to the theory of the action of electrocleaners, the writer believes it is due to the evolution of ox-hydrogen gas upon the surface of the metal when under the influence of the current." But a correspondent quickly disagrees: the cleaning is due not to ox-hydrogen, whatever that is, but to sodium and potassium being deposited at the cathode and reacting with the organic substances. This is proved by the fact that sodium chloride, or NeCk (*sic*), also acts as a cleaner, and there is no possibility of its giving off any hydrogen, because the only hydrogen in such a solution must come from the water which is un-ionized. If it were not for the annoyance of the chlorine gas given off, sodium chloride would be a good cleaner.

That the practical platers got into trouble when they sought theoretical justification for practical facts is evident not only from the above, but from many other pronouncements. Thus "A German authority has given it as his opinion that the value of zinc as a protection is due to its tendency to form an alloy with the iron; this is not an explanation but it points to one. If the iron of a zinc-iron alloy is less readily dissociated in the presence of oxygen and of acids or other agents which supply hydrogen, the efficiency of Sherardizing is explained. The reason for the resistance of iron thus alloyed would seem to be due to the contact effect between the zinc and the iron whereby the potential of the iron is increased at the expense of the zinc. The zinc becomes more sensitive to corroding influences, whereas the iron which is, so to say, over-saturated, resists decomposition."

Or again, explaining a patent on a method of cleaning metals such as silver by the now familiar aluminum + alkaline solution treatment.—tin was used instead of aluminum—"ionic tin carrying a positive charge is set free in the solution. The solution then contains ions of Na, H and Sn, all +, and CO_3 and and OH^-. The H and OH are derived by the dissociation of water. The Ag (silver) having a very much less electrolytic solution tension than the tin tends to collect all the positive ions in the solution, but the tin ions are not deposited on the silver because they replace (in the solution) those ions lost by the solution. Of these the H gives up its charge and escapes as molecular hydrogen. The + charges flow back to the tin outside of the solution and this electrolytic action continues. Now if the silver has upon its surface any tarnish consisting of a sulphide or oxide of silver, the nascent hydrogen reduces it to metallic silver, apparently without removing any of the silver."

As we glance back to the news of the day, we find the political conventions in full cry, for 1908 would mark the end of the first Roosevelt era. There were a great many parties in the field; in order of their meeting dates, the Populist, United Christian, Socialist with the perennial Debs, Republican, Socialist Labor, Democratic and the also perennial Bryan, Prohibition, and Hearst's Independence Party. The Socialist Labor group deserves passing mention for nominating a man for President of the United States who was at the time of his nomination in jail for homicide. Among the personalities in the news were several who died during the year: Edward MacDowell, the composer, at the age of 46, Joel Chandler Harris of Uncle Remus fame, and Bronson Howard, the dramatist. Commander Peary started on his polar expedition and the notorious Dr. Frederick Cook claimed to have reached the pole. The Wright brothers were breaking all records in the air, Wilbur having stayed aloft for 2 hours 20 minutes 23½ seconds and reached a height of 2280 feet at LeMans, in France. The Abe Ruef case, which had San Francisco by the ears, ended in his conviction for bribery and a sentence of fourteen years. Later in the year Ira Sankey, the evangelist, and Grover Cleveland received obituary notices.

But the man of the year as far as the electroplating

trade journals were concerned was, by a wide margin, the English inventor Sherard Cowper-Coles. Hardly an issue went by without the prominent mention of his name: he extols Sherardizing process (a method of dry galvanizing); he writes that the Preece test is unsuitable for testing Sherardized or electrogalvanized material; he invents an improvement in brass plating involving the use of copper and zinc anodes in two separately controlled circuits; he becomes involved in a polemic with an American author who has developed a process somewhat similar to Sherardizing; he proposes to manufacture iron tubes by the electroforming process, utilizing iron ore as a starting material; and a letter to the editor extols the Cowper-Coles Electrolytic process of electroforming mirrors by plating on a glass form and then stripping the deposit. The letter is signed only with the initials S.C.C.

In view of the present interest in standards for gold-plated ware, we may note that this was a subject of concern in 1908; an editorial is critical of the U. S. Gold Stamping Act of 1907, remarking that the law is a dead letter unenforced and unenforceable. Principally, says the editor, this is because stamping is permissive and not mandatory: the law merely requires that if ware is stamped it must be stamped honestly, but verbal falsification of unstamped goods is not covered. One of the journals of the Jewelry trade apparently took issue, for our journal returns to the attack a few months later, and has a little fun at the expense of its adversary by quoting the Jeweler's organ on a different subject: "The jeweler of revolutionary days was . . . skilled as a workman in all kinds of metals—gold, silver, copper, and every non-ferrocious metal known at the time. In passing," cracks the editor, "we might note that this is about as accurate technical information as it found in most of the jewelry papers."

An article on Electrical Equipment for Plating Plants repeats that some plants rely for voltage reading on "nothing but a file stuck across the two bus bars of a tank and judging by the size of spark that appears." It would seem that the glowing picture of progress painted at the beginning of the year must have had its dark patches.

Color harmony in plating turned up several times as a subject for editorial comment, as we have already noted; to quote once more, "The plater now has at his disposal all the colors of the rainbow and a few that were never seen in the firmament above or the depths below. Having such a profusion at his command it is small wonder he uses them with a prodigality that knows no limit. He cheerfully mixes his colors, groups the results, stands back and gazes at his own creation in dumb admiration. He does not know he has violated all the laws of harmony and that his 'creation' will be pronounced an abortion by the first artist who sees it or the first one who has an appreciation of the balance in nature."

An editorial on Trade Secrets seems to have a sort of continuing appositeness: "During the past twenty years we have visited hundreds of manufacturing plants, big and little, good and bad, clean and dirty, in all parts of the country and never yet saw a trade secret or even heard of one that was large enough to be measured with a micrometer. As actualities they are mighty elusive but as rumors they are as plenty as Hamlet's fleas. Before having been conducted through a works we have often been pledged to say nothing about the methods or appliances of the concern. After . . . we would . . . breathe a blessing on the man who had made us promise to say nothing about his plant—he had saved us the trouble of writing a story that was not worth the writing."

It is a significant fact, says an author, that the metals most amenable to the electroplating process are metals which alloy readily and which are easily soldered together. Hence the theory that both electroplating and soldering depend for the firm uniting of two metals on surface alloying at the point of contact. A "foolproof" small automatic plating device (designed for jewelers) is introduced with these philosophical words: "Although as time goes on the human race is supposed to become more and more enlightened there is also an ever increasing tendency to make things 'foolproof'. In spite of statistics to the contrary it seems to be a praiseworthy practice."

An article on copper and brass plating demonstrates once more the practical man's difficulties with theory. The fundamental law governing the handling of plating solutions in general is to have them rich in metal, or in the vernacular to "keep the guts in," we are told. In practice, however, we are hampered by the fact that a solution rich in metal also contains a correspondingly large amount of inert salts which are highly resistant and necessitate a strong current.

Not realizing what he was starting, a contributor gave as his opinion, in a short note, that the practice

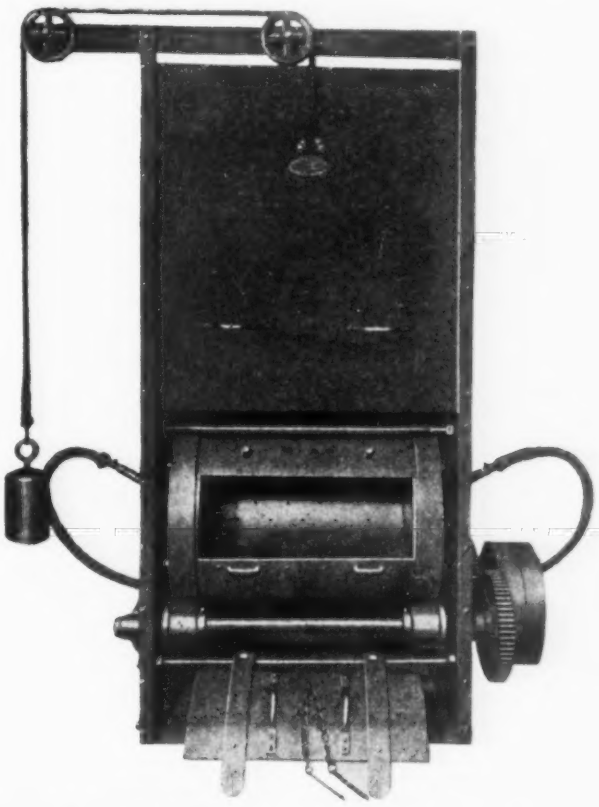


Figure 3. 1908-type sand blast tumbling barrel.

of scrubbing nickel anodes frequently was wrong and should be discontinued. It was a waste of nickel, he said, and anodes with scum on them dissolved better than clean ones. The next issue carried two letters, one agreeing fully and the other disagreeing just as completely; for one thing, said the writer, what was meant by a nickel anode? There were all kinds: pure, impure, cast, rolled, etc., and they ought to be scrubbed. By the next issue the number of correspondents wishing to express an opinion on the subject must have been roughly equal to the number of subscribers, and the succeeding issue might just as well have been given over entirely to the debate. Correspondents were having their rebuttals and re-rebuttals, and the remarks were getting just a little bit personal. "Mr. Brown's notions on plating are unique, interesting and singular," etc. By a majority of about 75%, however, the concensus was, don't scrub. Through all this the competitive journal maintained a grave silence, and then published the following editorial note: "Nickel anodes always give better results if frequently cleaned. The slime which always forms on good anodes is caused by the carbon and other substances which are contained in them. If these are allowed to accumulate they prevent the action of the current."

The agony, or question and answer, columns now call for a little attention; and it is worth remarking in passing that the progress noted by the editors is reflected to some extent in this department. More and more the questions asked are straightforward requests for information, usually about special finishes, and there are many fewer "dumb" inquiries which reflect the questioners' lack of fundamental knowledge. Since this series is concerned with the flippant aspect, we shall not pause over the serious questions, but rather seek the exceptional. A note of pathos catches our eye in this: I have bought a nickel plating outfit from one of your advertisers as I wish to do my own plating but so far have not been successful as you will see by the samples. The bright one is what I have been receiving and the dull one is what I did. Please tell me the trouble.

Or this: Q: Enclosed find sample of what we've been up against in the shape of pitted work. We have heard of a dozen reasons for this and have tried twice that number of cures and we are still unable to say positively what causes it or what will stop it. A: The cause of the pitting of the nickel surface is due to occluded hydrogen—that is the hydrogen formed in the solution does not rise sufficiently from the surface of the metal but condenses and practically burns into the nickel. This occurs mostly when the solution becomes slightly deficient in nickel or when constantly adding the double salt the trouble is caused by an excess of ammonia sulphate. The best remedy is to use only the single sulphate of nickel for your class of work thus avoiding an excess of ammonia sulphate. Currents of air forced by pressure into the solution of very slight motion of the cathode rods will also help to overcome the defect. Let us hear how you get along.

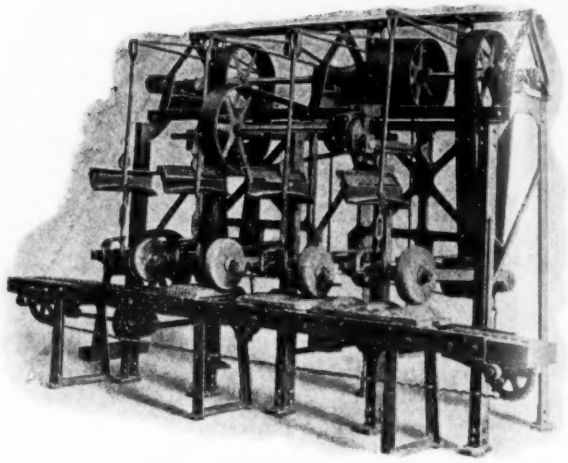


Figure 4. Four-Wheel automatic polishing machine, 1907 style. Without the belt and pulley system, this could well be a modern setup.

Q: Does aqua regia have any effect on brass? A: Aqua regia when cold and free from water has very little action on brass, but it is the only practical reducing (*sic*) agent for gold.

Q: Someone wants to sell me a formula for nickel plating which requires no cleaning of the base metal. Is that possible? A: Don't fall for it.

Q: Our plating room is directly over the office and the wood floor has rotted; leakage results in damage to fixtures and office supplies. A: You might try asphalt paint. (Or move the office?)

Q: What is the cause of yellow sediment in the bottom of the nickel tank? A: It is a basic sulphate of iron and nickel and is not harmful if it does not touch the work. Anodes should be scrubbed as often as possible. (Here we are again.)

Q: I have trouble with my nickel solution crystallizing during the cold weather. The anodes and sides of the tanks become coated with it. Is it the lowering of the temperature that causes it? (He got a serious answer, though.)

Do you think stop-offs are a nusiance? Consider:

Q: Is there anything that can be used to prevent deposition of metal on plating racks? A: We regret to say there is no satisfactory method. Asphalt paint is as good as anything but useless against hot cleaners. Enamelled racks have been tried with little success, as the enamel chips. It is customary to allow metal to deposit on the racks until they become too cumbersome, when they are sold.

Q: My 200-gallon nickel tank has been injured by a discharged employee. He added a quart or two of copper solution to it and the work comes black and streaky. How can I reclaim it? A: Continued plating will work the copper out, but this is slow. The best method, though troublesome, is to pass sulphuretted hydrogen through to precipitate (throw down) the copper, filter and boil the solution to get rid of excess gas. On the whole, the best bet is to throw it away.

Q: Will a good deposit of nickel tarnish within a short time if left exposed to air? A: As all nickel anodes contain iron, a small amount of this metal deposits with the nickel and causes it to tarnish. A weak dip of muriatic acid after the articles come from

the nickel bath will frequently remove the iron and prevent the goods from tarnishing.

Q: How can I use a 210 volt lighting circuit for plating? A: Connect your motor which is run by the lighting current direct to a small dynamo capable of giving 6 volts or less—or in other words to a regular plating dynamo . . . in this manner the combination of the motor and dynamo produces a transformer which transforms the volts into amperes, which is what you need.

We must pass rapidly over the notes of new developments which dot the journals. A patent is cited which tells us that although it is well known that sugar brightens deposits (any deposits, apparently), the effect is short-lived, and can be accentuated and prolonged by adding in addition to the sugar an enzyme or yeast, such as beer barm. (But platers have better uses for beer.) A new patent provides for a reciprocating movement of the cathode bar, allowing greater speed in nickel deposition. We cannot take note of the numerous patents on mechanical plating apparatus, but Cowper-Coles (again) receives patents on electrolytic copper foil, electroforming of cartridge cases, and electroformed mirrors; and remarks that aluminum sulfate is a good brightener for copper plating baths. Edison patents a process for electroforming iron cans for his storage batteries, the cathode rotates in a solution containing carbon in suspension, which not only burnishes the deposit as it is formed but plates out slightly, forming an alloy deposit. A new rustproofing process for iron is announced by Coslett, of England, involving phosphoric acid + iron filings to give a coating of ferric phosphate.

A note tells us that an acid bath for silver plating is needed because the alkaline solution attacks the resist (stop-off). But since there is no satisfactory acid bath, research on the subject is needed. And a process for producing poreless and strongly adhesive deposits had been patented in Germany. The inventor claims that if a metal which is to be electroplated is first coated with a soft metal such as tin then electroplated and afterwards heated to a temperature which will melt the tin, the electroplate will unite with the base metal and become very strongly attached to it. It is claimed that the deposit or coating thus produced is poreless and adheres stronger than ordinary electroplate. (The grammar is not mine.)

We are advised that it is a fallacy to add hydrocyanic acid to cyanide plating solutions to expel the carbon dioxide and regenerate potassium cyanide, because HCN is a weaker acid than H_2CO_3 and will not drive off CO_2. We are told that imperfections and joins between two metals cannot be hidden by electroplating, which is not like paint; it accentuates, not hides, scratches.

The paucity of new plating solutions in the patent literature contrasts strongly with more modern conditions. Only three of any interest seem to have been turned up by the trade papers: a zinc fluosilicate solution; a method for chromium plating involving a solution of chromic acid + chromic oxide, worked at 3-6 volts and 20-50 amperes per square foot, giving a deposit of fine color, very flexible and *harder than steel* (italics in original); and a patent for using alcohol instead of water for making up plating solutions, utilizing metallic chlorides as solutes. The idea seems to be that in alcohol no hydrogen is evolved at the cathode so that efficiency must be 100%; all metals but silver and lead are amenable to this treatment.

Feature articles dealt with the great importance of proper cleaning; immersion nickel coatings; special finishes galore; deposition of true tin-copper bronzes (don't try it, is the conclusion); plating on lace; electrogalvanizing; black nickel; copper plating on aluminum (using a mercury nitrate dip), and many other subjects of ephemeral or lasting interest.

And so the sands of 1908 run out. It was a relatively quiet year on the labor front though the papers recorded strikes and riots here and there, including the usual coal strike on April first. Chelsea, Mass., was practically wiped out by a $10,000,000 fire which made 10,000 homeless. The State Department spent the year signing arbitration agreements with almost all the countries of the world, and the U. S. and Japan agreed to maintain the status quo in the Pacific, including the open door and the independence and integrity of China. The sovereign people expressed their preference for the genial Taft over the Great Commoner by 7,600,000 to 6,400,000, while the Socialist Labor party was nosed out with 15,421 ballots.

Our trade journal remarked that "there are few trades that have expanded within the past 25 years as much as electroplating, and it is not too much to say that it is electroplating which has made the expansion of the cold-rolled steel industry possible, by enabling it to be used in ornamental applications. The future of electroplating is very favorable."

Tune in again to see what happens in 1909.

Industrial Plating of Zinc Base Die Castings

By Charles Temple, *Supt. of Finishing, Globe Slicing Machine Co., Stamford, Conn.*

WHILE the production of zinc base die cast parts for slicing machines is on a moderate scale, it is nonetheless important that these parts have excellent corrosion resistance plus the eye-pleasing appeal of the decorative sections. The machines on which these parts are assembled are used under exacting conditions in the butcher shop and delicatessen.

Attack of the sort that comes from meats and certain cheeses would be quite hard to duplicate in any other field, such as automobile hardware, casket hardware or household appliances. The acidity or alkalinity of many types of foods is quite disastrous to all types of finishes, and particularly is this true of the present-day finishes on zinc die castings.

With the particular processes used in the plating room it is not necessary to bring up a high lustre on the parts before plating. The parts come to the plating room without a final color buff. In other words, all that is necessary is a cut-down operation, bringing the die cast to a comparatively pore-free finish. The final appearance is as good as could be obtained by giving the parts a mirror buff before plating.

For plating racks, hex-copper stock of sufficient size to afford full current capacity is used. Parts are racked so that maximum throwing power in the recesses is obtained and so that burning on the high current areas is minimized. All racks are coated with a proprietary rack tape so that there will be no surfaces needlessly exposed.

The die cast parts are first degreased to remove the excess buffing compounds and then cleaned in a reverse current die cast cleaner. This material is operated at 160° F. at five to six volts with a concentration of six to eight ounces per gallon. They are allowed to remain in the cleaner for one minute to one and one-half minutes, depending on the part. They are then rinsed in two cold waters and immersed in a 5% muriatic acid solution for about 15 to 30 seconds or until a good evolution of gas results. Then the parts are again given two cold water rinses and placed in the copper plating tank. Figure 1 shows some of the parts entering the cleaning cycle where they will remain for the 60-second period with reverse current at 6 volts.

The copper plating solution is a proprietary bright bath and no striking is necessary, although some parts are given a strike. This is done in the same tank that is used for the bright plating and is done by raising the current to 100-150 amperes per square foot for about one to two minutes and then dropping the current to the bright plating range, which is about 30 amperes per square foot for a period of ten minutes. This solution is operated at 135-145° F., and a pH of 12.6—13.3; however, best results are obtained at a pH of 13.0. It is possible to bring the work out with a mirror brightness even after it has been subjected to extremely high current by reducing the current to the normal bright plating current for about two minutes.

Figure 2 shows the operator removing some of the parts that have just been bright copper plated for a period of ten minutes. These parts have a copper deposit of .00035. The work is constantly agitated at 20 feet per minute. This helps obtain a much brighter and finer deposit and no color buffing is necessary prior to bright nickel plating. With increased agitation, it is possible to run up as high as 100 amperes per square foot and still maintain maximum brightness. The most important points in this bath are pH, temperature and current density.

After two cold water rinses and a dip in a 5% to 10% muriatic acid pickle and one cold water rinse, the parts are placed in the bright nickel solution. This is also a proprietary bath operated at 125° F.

Figure 1

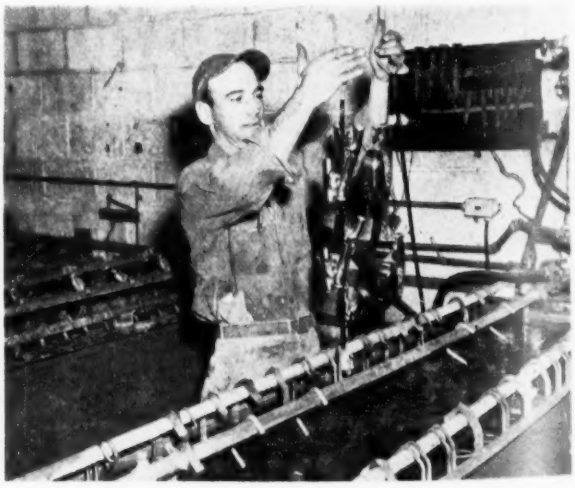


Figure 2

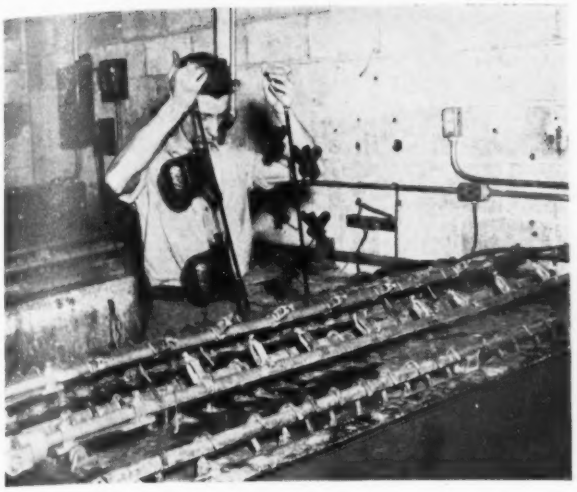


Figure 3

Figure 4

at a pH of between 4.5 to 5.2. Plating time is 20 minutes, giving a thickness of .0005 of an inch. Control of this solution is comparatively simple inasmuch as the pH range is wide and the temperature range is from 120° F. to 160° F. The current density ranges from 15 amperes per square foot to 100 amperes per square foot depending on the part and the amount of agitation. In this solution also it is possible to raise the current to the maximum with the proper amount of agitation.

Using the aforementioned cycle, buffing or coloring is eliminated between the time that the parts leave the polishing department and the time they enter the chromium plating tanks; leaching out of the zinc in the part due to the attack of the nickel solution is also eliminated. This has reduced the cost of operating the bright nickel solution due to the fact that it is not necessary to treat as often as normally would be necessary when a nickel solution becomes contaminated with zinc impurities.

The work is given two cold water rinses and then chromium plated. The chromium plating bath consists of 40 ounces per gallon of chromic acid and .30 ounces per gallon of sulfuric acid. A temperature of 110 to 120° F. is maintained, depending on the type of work that is running. Obviously, the higher temperature at a higher current density affords better throwing power, but unfortunately, some of the work does not lend itself to racking and must be wired; therefore, the temperature and current must be reduced so that the wires do not snap from overheating and drop the work into the tank.

Figure 3 shows some of the parts coming from the bright nickel solution after plating for a period of 20 minutes at a current density of 50 amperes per square foot. This work was agitated at 20 feet per minute while plating and it had a thickness of .0005 of an inch. Note the battery clamps on the cathode bar. These were used to replace the common cathode clamps which were unavailable during the war.

Figure 4 shows other parts which had just been bright-copper and nickel plated, ready to go into the chrome plating tank. These parts are chrome plated for a period of two to three minutes at a temperature of 120° F. and at 150 amperes per square foot. They are racked so that the high current density areas do not burn, thereby eliminating color buffing after chrome plating. The parts are then given one cold water rinse and a light caustic soda dip to neutralize any remaining chromic acid, then another cold water rinse and a hot water rinse to facilitate drying. They are then unracked, put into boxes and taken to the assembly department where they are stored on shelves until such time as they are needed.

All the plating solutions are kept under constant filtration to assure against contamination, which causes rough deposits and poor plate. Obviously, a rough finish or cloudy, spotted deposits would require coloring and defeat the purpose of the bright plating baths. All die cast parts are given a thorough inspection before being assembled on slicing machines for any defects in the plated coating which might have gone through the plating department unnoticed. Any parts found to be defective are stripped of the nickel in a reverse sulfuric acid and glycerine bath and stripped of the copper in alternating dips in sulfide and cyanide baths. Rejections of plated coatings by this technique are less than one-half of one per cent.

Summarily, bright lustrous deposits are obtained without any intermediate buffing or coloring. The finished product has been widely accepted by the trade and has proved to be less costly than the finishes applied during the post-war period. This obviously can be attributed to the fact that valuable man-hours are not consumed in the coloring of either the copper or nickel and the man-hours which would be necessary in the high coloring of base die cast parts.

The same copper and nickel cycle is used for all of steel parts. It is found to be advantageous because of the elimination of color buffing on copper plated parts prior to bright nickel. Steel parts are prepared in the polishing department with a burring compound finish which brings the steel to a smooth finish prior to entering the plating room. The parts are then degreased in bulk and brought to racking stations in the plating department where they are racked for cleaning in an alkaline cleaner designed especially for steel parts. After cleaning and pickling, the parts are ready to follow the same procedure as any of the die cast parts.

Electrolytic Polishing of Magnesium

By George Black, *Hollis, N. Y.*

IN AUGUST 1944, an article was prepared by P. Jacquet[1] and the method described was primarily concerned with electrolytic polishing prior to metallographic examination of magnesium alloys. According to R. T. Wood,[2] the Jacquet method has been tested and found to be quite satisfactory.

The production of excellent flow-free surfaces on magnesium and its alloys can be accomplished through the use of an electrolyte consisting of 375 ml. of orthophosphoric acid, density 1.71 and 625 ml. of 95% (by volume) ethyl alcohol. The magnesium sample serves as the anode and 18-8 stainless steel or nickel sheet as the cathode. Prior to electrolytic polishing, the surface is ground down and mechanically polished to a smoothness equivalent to at least that which is obtainable with 000 emery paper. The more and finer the mechanical polishing, the less time required for electrolytic polishing.

It is pointed out that manganese particles, magnesium silicide, and massive Beta Mg-Al eutectic particles are not appreciably dissolved during electrolysis, even though the duration of the treatment is extended. Ordinarily, provided suitable mechanical polishing has been performed, the duration of electrolysis may be approximately 3-5 minutes; however, in cases where mechanical polishing is incomplete, as much as an hour of electrolytic polishing may be required to achieve the necessary smoothness. The Jacquet method employs a closed circuit voltage between cathode and anode of 1.5 volts, with a current density between 0.5 and 1.0 amperes per square decimeter.

It is recommended that the sample be removed from the solution while the current is still on, and then immediately washed and dried. Examination may be performed on the specimen in the polished condition, or it may be suitably etched in accordance with standard practices. The process is proposed for metallographic samples only, and no data is available on attempts to use this method for larger and more complicated surfaces.

Further information on this subject was primarily

All photographs courtesy Dow Chemical Co.

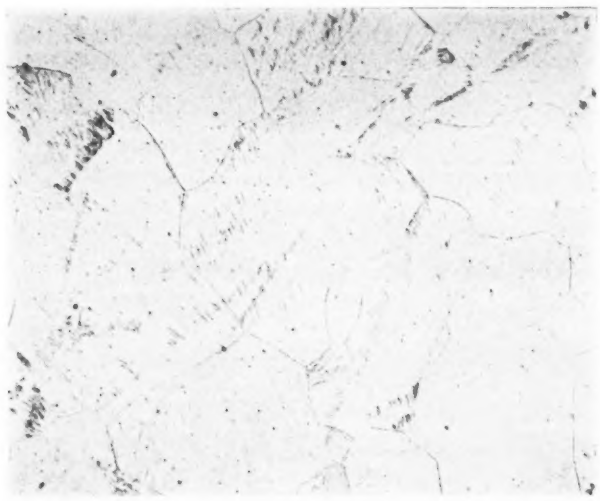


Figure 1A. Mechanically polished commercial magnesium, extruded.

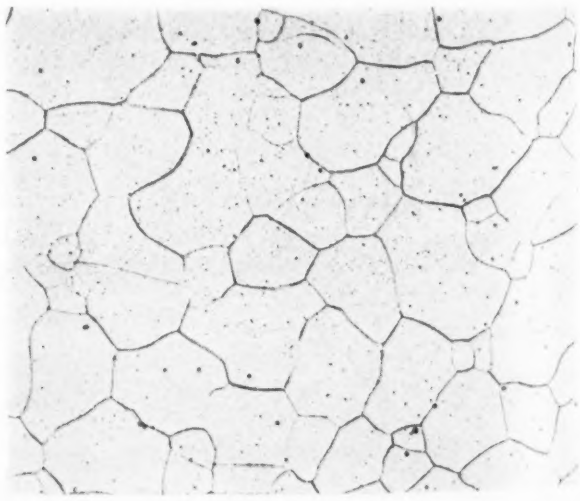


Figure 1B. Electrolytically polished commercial magnesium, extruded.

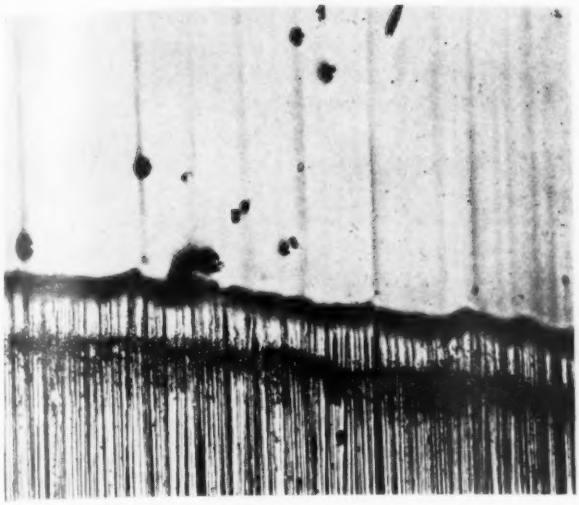


Figure 2. Electrolytically polished Calloy SHT showing effect of scratches from 0 paper.

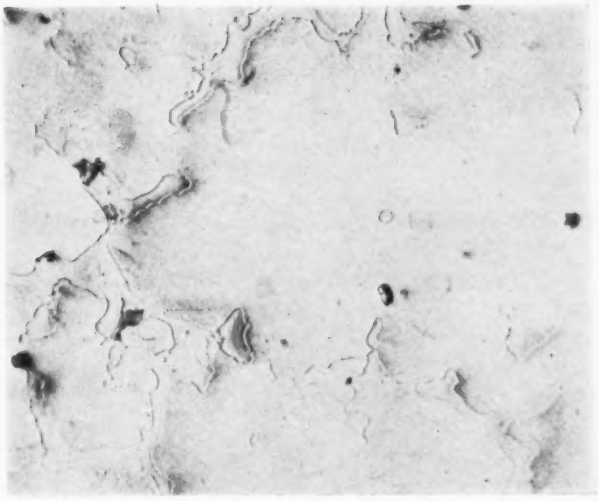


Figure 3. Electrolytically polished magnesium, unetched.

concerned with the polishing of metallographic samples, but sufficient data was given to hazard conclusions with respect to the general value of the electrolyte discussed.

In accordance with the information received from P. F. George,[3] a great deal of success has been achieved in the field of electrolytic polishing through the use of a cold 70% acetic acid, 30% perchloric acid (60%) solution, with a current density of 1.5 amperes per square centimeter and an impressed voltage of 6. The solution is agitated to prevent overheating and the specimen must be removed and washed very quickly to prevent over etching. In addition to the rapid attack on the metal by the electrolyte, this method has the further disadvantage of employing a solution which is explosive under given conditions.

The successful polishing which is achieved may be clearly seen through an examination of Figure 1, which shows a sample of commercially extruded magnesium mechanically polished compared with one which has been electrolytically polished by the acetic-perchloric electrolyte. The absence of cold work in the electrolytically polished surface is apparent.

Because of the difficulties described above, laboratory chemists welcomed the publication of British patent 550,176 and a complete study was planned of the polishing action described. Using the electrolyte consisting of hydrochloric acid in ethylene glycol monoethyl ether, thorough testing was undertaken which included a study of the effects of bath composition, composition of the cathode, electrode, spacing, temperature, agitation, size of cathode, size of anode etc. It is interesting to note the reasons for conducting the experiments, and the following is quoted directly from a report[4]:

> "Electrolytic polishing of metallographic specimens is desirable because it leaves the specimen surface free from cold working, scratches and other defects caused by mechanical polishing. It is quicker than mechanical polishing because the time required is independent of the specimen size. Most polishing solutions which have been advanced for anodic polishing of magnesium alloys are made of explosive materials which are too dangerous to be handled on a large scale. The materials named in British patent No. 550,176, ethylene glycol monoethyl ether and hydrochloric acid are not explosive. They are readily obtainable, therefore, this method of electrolytic polishing seemed worthy of investigation . . ."

Polishing tests were made in a cylindrical glass tank six inches in diameter and four inches deep, holding about 800 ml. of solution. Direct current was obtained from a Tungar battery charger which would supply up to 72 volts. Current and voltage control was achieved by means of a rheostat in series with the polishing cell and the source. The temperature of the bath was controlled by means of a glass coil running around the inside of the tank. Through this coil, water of any desired temperature could be run at will, and the temperature of the solution maintained with comparative ease.

As a result of the numerous tests run, it was discovered that optimum polishing can be obtained with a bath composition of 10% hydrochloric acid and a bath temperature of 10° C. or less. The other controlled conditions may vary greatly without affecting appreciably the degree of polish. Smoothest polishing takes place between 10 and 15 volts, but a high voltage is needed to stop the initial violent attack of the solution on the specimen. If the specimen is allowed to become too rough during the first stage electrolytic polishing may be exceedingly difficult.

To polish a specimen flat as quickly as possible, the specimen should be ground flat and finished on 000 emery as suggested above. Scratches which are deeper are only rounded out unless extremely long polishing is employed. Figure 2 demonstrates the effects of mechanical polishing with 0 emery paper and then electrolytically polishing for two minutes. One half of the specimen was covered with polystyrene lacquer so as to preserve part of the scratches for comparison purposes. Notice how plainly inclusion and manganese particles stand out in the polished portion.

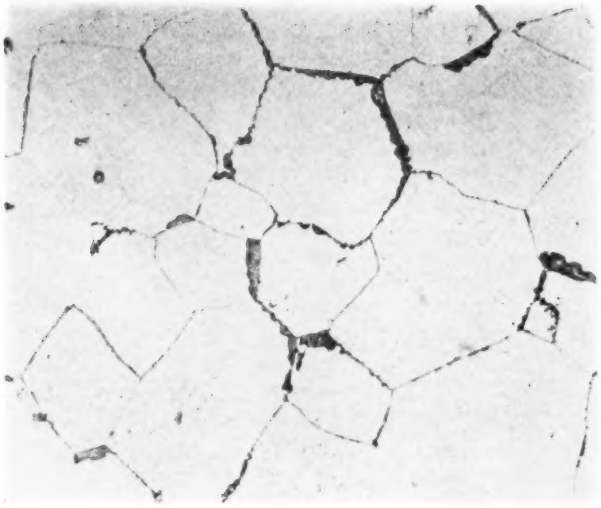


Figure 4. Electolytically polished magnesium, etched in polishing solution.

It is known that the smoothest polishing occurs on the flat portion of the polishing curve; therefore all the factors discovered during the various tests which increased the length of the polishing range are worthy of consideration. In general it can be said that increasing the viscosity of the solution lowers the critical voltage, and the viscosity may be increased by decreasing the temperature and increasing the concentration of HCl. In order to minimize reactivity between the solution and the specimen, and to prevent subsequent heating, mild agitation is recommended as well as adequate spacing between anode and cathode. It is further recommended that holders be designed which will accommodate at least 10 specimens at a time, and that the back and sides of these specimens be shielded with lacquer to prevent exposing excess area in the polishing bath.

Specimens of various alloys in different heat treated conditions were examined in the electron microscope to determine whether the instrument's high resolving power would bring out the microstructures. Results indicate that this method of electrolytic polishing produces surfaces which are too smooth for metallographic examination. (See Figure 3.) It was therefore decided to study the etching effect of the electrolytic polishing bath.

The solution of 10% HCl in ethylene glycol monoethyl ether proved to be quite a satisfactory etchant. Best etches on most alloys were obtained by turning off the electric current after polishing, and allowing the solution to attack the specimen. (See Figure 4.) This method does not work on pure magnesium or on M alloy because it leaves the surface pitted. Satisfactory etches on these metals can be obtained by drying the specimen after polishing and then redipping into the solution under a potential of 30-40 volts. Specimens must be removed and washed as soon as violent attack stops.

On the safety side it is pointed out that the solution of HCl in ethylene glycol monoethyl ether may cause the skin to stain brown and crack over a period of time, but no harm results if the solution is washed off soon after contact. The odor of the solution is acrid, but not unpleasant, and the nose and throat are not irritated unless the operator gets unnecessarily close. Although the solution is flammable and burns with a quiet blue flame when ignited, it can easily be extinguished by blowing it out.

Further investigation was made of the feasibility of producing bright finishes on large objects by this method of electrolytic polishing. Little success was demonstrated because the violent attack of the solution upon the specimens could never be completely stopped. It was noticed, however, that the colder the solution was kept and the more effectively the specimen was cooled, the larger was the area over which the violent attack could be stopped. The report optimistically concludes with these words. "It is believed that by using a more efficient cooling system, it would be possible to electrolytically polish large objects. More work should be done to determine the necessary conditions, for such a process would be of great value to the magnesium industry." It will be interesting to follow future developments along this line. Electrolytic polishing of magnesium on a production basis is an achievement worth the fullest efforts of research.

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1. Sur La Micrographie du Magnesium et du Zinc, by P. Jacquet, *Metaux-Corrosion-Usure*, V.29, July-August 1944, p. 71.
2. Personal Communication, Robert T. Wood, Chief Metallurgist, American Magnesium Corporation.
3. Personal Communication, P. F. George, Dow Chemical Company Laboratory Development Division, Magnesium Laboratories.
4. Dow Chemical Company Laboratory Report No. 12934.

This Is Washington

By George W. Grupp, *Metal Finishing's Washington Editor*

Taxes and Labor

The passage of the tax-reduction bill and the labor-management measure, and President Truman's action on these two pieces of legislation, may become important deciding factors in the 1948 presidential election.

Both measures are the result of popular demand for tax relief and labor reform.

Tax reductions, judging from past experiences, usually stimulate capital investments in new enterprises and in productive expansion projects. Then too, such reductions give industry an opportunity to build up reserves for recessions in consumer demands.

The opponents of tax reductions feel that continued high taxes and debt reduction are more important to the nation's welfare.

The opposite school of thought points out that the refusal to grant tax reductions this year will only result in a more drastic tax measure in 1948 which will have great political repercussions.

The fierce battle for the passage of the labor-management measure in the 80th Congress will not be forgotten by labor unions. All informed persons are aware that the unions will at least instruct their members how they should vote in the next presidential election.

Those, however, who were behind the current labor-management legislation feel that such a measure is essential if we are to attain the industrial stability needed during this world reconstruction period.

The Record of the 80th Congress to Date

The progress and accomplishments of the 80th Congress, since it took up the affairs of state on January 3, 1947, have often been fairly and unfairly criticized. The unfair criticism was often of New Deal origin and from those who seem to be unaware that it takes time for a party which has been in the minority since 1933 to completely reorganize committees, pick committee chairmen, select men to handle certain legislative duties and become familiar with the work and workings of a Congress.

Then on top of that the 80th Congress had to adjust itself to the newly effective Legislative Reorganization Act—an act which changed congressional methods which had been in vogue for over 150 years.

Out of the thousands of bills introduced in both houses of Congress (on which countless committee hearings have been held) a reasonable number have been passed. The most important measures passed by the 80th Congress are (a) the portal to portal act; (b) the limitation on presidential tenure measure; (c) the humanitarian measures to aid China, Greece, and other countries; (d) the reduction of the budget; (e) the reduction of income taxes, and (f) the labor-management measure.

The most important problems now before Congress are (1) the housing shortage; (2) the merging of the armed services; (3) prices and production; (4) rents; (5) the St. Lawrence Waterway; and (6) foreign relations.

RFC Aids Small Business

Representative Wright Patman of Texas recently told members of the House that small business is now in need of the Reconstruction Finance Corporation more than ever before.

In making his plea for the continuance of the Reconstruction Finance Corporation he made the observation that stable economy of the United States depends on a strong healthy segment of small business because of its diversity of types and kinds of businesses, because of its geographic distribution, and because it lends itself readily to ambitious persons with some capital and their skills to fill a particular local need.

The importance of small business as a national economy stabilizer is emphasized by the condition that over 3,000,000 small establishments (which includes metal and organic finishing firms which are mostly small concerns) are the sources of income of about 60 per cent of all persons gainfully employed in the United States.

Some may not know it but the Reconstruction Finance Corporation has always been an available source of credit to small business when funds were not obtainable from private sources. For example, dur-

ing 1946 out of 12,247 approved RFC loans 11,148, or 91 per cent, were granted to small concerns.

To put this another way, out of a total of 40,148 approved RFC loans totaling $3,776,954,848, during the period extending from 1932 to April 30, 1947 inclusive, a total of 36,174 loans amounting to $337,915,021 were granted to small firms in amounts ranging from a few thousand dollars to $100,000.

Method of Restoring Pickling Liquor Strength

A report called: "PB-44958: Contribution to the Regeneration of Pickling Solutions," (Office of Technical Services, Commerce Department; $1.00 per photostatic copy), describes how the original strength of spent pickling liquor can be restored by the addition of ethyl alcohol followed by fractional distillation. This German alcohol method is said to be very efficient and economical in removing practically all iron and regaining all the acid solution for further pickling use. In this report four methods now being used to evaluate or regenerate old and superconcentrated pickling liquors are discussed such as: Precipitating the excessive iron and sacrificing the acid solution; electrolytic deposition of iron and regeneration of the acid; freezing out most of the ferrous sulphate and regeneration of the acid; and separation of all the ferrous sulphate by the addition of ethyl alcohol and the regeneration of the acid.

German Method of Determining Iron in Light Metals

According to a report called "PB-53890: Colorimetric Iron Determination in Light Metals Using Sulfosalicylic Acid," a lot of time lost in determining the iron in light metals can be avoided by a German developed colorimetric procedure using sulfosalicylic acid. This report, which is illustrated with a diagram of the test procedure, calibration charts and tables, may be had from the Commerce Department's Office of Technical Services at $1.00 per photostatic copy. The colorimetric method, described in this report, shortens the analysis time by avoiding the separation of iron, as is required in the process of titrating ferrous ions with permanganate. In the colorimetric method a small amount of the light metal alloy is dissolved in an acid solution. When the solution is combined with specially prepared sulfosalicylic acid the presence of iron causes the solution to turn red. The amount of iron is measured by using an electric colorimeter with a green filter.

American Business Directories

The Department of Commerce has just issued its second edition of "American Business Directories." This 198 page book is designed to help businessmen locate sources of supply with lists of prospective customers for their goods and services. This roster of business directories may be obtained from the Superintendent of Documents, Washington, 25, D. C., or from one of the Commerce Department's regional offices, for 65 cents.

Antimony and Tin Supplies and Controls

At a recent hearing of the House Subcommittee 4, of the Judiciary Committee, on H.R. 3647, Director H. B. McCoy of the Commerce Department's Office of Materials Distribution made these observations on antimony and tin: "The position of tin has deteriorated since Mr. John C. Houston, then Commissioner of Civilian Production and my predecessor as administrator of these controls, appeared before this committee in March. Domestic requirements for the fiscal year 1948 remain approximately 90,000 tons, on a restricted basis, and 121,000 tons if controls are lifted. However, estimates of world supply made public by the inter-governmental Tin Study Group in Brussels, on April 18, 1947, were revised downward from previous levels, and indicate that the shortage will continue well into 1948. Elimination of controls at this time would wipe out the Government-owned reserve available for industrial use before the end of this year, and leave the country entirely on new supply in 1948.

He continued: "as in tin, the situation for antimony has deteriorated, estimates of new supply being somewhat lower than earlier in the year. The most important effects of decontrol would be a serious dislocation of the distributive system, a mal-distribution of stock and a speculative market in which, however, higher price would not be compensated for by any increase in supply. The result would be that a large number of consumers could not get sufficient antimony to maintain a reasonable rate of operation, that some would be totally deprived of materials and that shutdowns, unemployment and loss of profits would unquestionably eventuate."

The Most Dust-Free Zinc Works in World

A 45-page report has been issued by the Office of Technical Services of the Commerce Department which describes what is said to be the cleanest and dust-free zinc works in the world. This report gives the details of zinc production and fabrication, as well as byproduct recovery processes, of an Italian plant. The factory's unusual cleanliness is attributed to its superior construction and emphasis on dust suppression. All points likely to permit the escape of dust, such as bin discharges and roasting furnace exits, are fitted with hoods leading to dust filters. The report is illustrated with diagrams, flow charts and photographs. It is entitled: "PB-52855: Zinc Works at Porto Marghera, Italy"; Price: photostatic copy, $3.00.

Surplus Zinc Oxide Plant Sold for $102,000

Recently the War Assets Administration announced the sale of the war-surplus zinc oxide reclamation plant located at Fort Smith, Arkansas to the Residue Company for $102,000.

How Japs Extended the Life of Electrodes

The Office of Technical Services of the Commerce Department has issued a report called "PB-63912:

Ferroalloy Metallurgy of Japan," illustrated with photographs, charts and tables, at $4.00 per photostatic copy. Among other things, this report describes how the Japanese ferroalloy industry effected appreciable savings in electrode life by wrapping thin sheet iron around the electrodes to minimize oxidation losses caused by hot gases and flame while melting.

Sheet Metal Bubble Testing Method

For 25 cents one can obtain from the Commerce Department's Office of Technical Services a copy of the 8 page illustrated report called "PB-25556: The Non-Destructive Testing of Materials and X-ray Protection Methods" which describes the German supersonic testing method used to locate bubbles in sheet metal which are too small for detection by X-ray or magnetic techniques.

Help Wanted

Recently the National Inventors Council of the Commerce Department issued a list of typical problems in national defense posed by the Army, Navy and Coast Guard which it hopes American inventors will solve. They want inventors with solutions to forward their proposal to them. Here are two problems which should be of interest to readers of *Metal Finishing*: (1) light-weight high strength, non-corrosive structural metals; and (2) a solution of the problem of fungi and corrosion prevention on all types of material, particularly, electrical equipment.

Semi-Transparent Mirrors Described in Report

Semi-transparent mirrors that absorb only one to two percent of light and transmit light without coloring it perceptibly, as made in Germany, is described in report "PB-4158: German Vacuum Evaporation Methods" which may be had from the Commerce Department's Office of Technical Services for $3.00 per photostatic copy. The report describes the "Steinheil-2" mirror which consists of a film of titanium dioxide on a glass base. The maximum reflectivity of this type of mirror is 42 per cent. Light passing through it acquires a perceptible pink tint. On the other hand the Heracus mirrors are said to have a maximum reflectivity of 85 per cent.

No Depression Expected in 1947

The Congressional Economic Committee, which began holding hearings on June 23, 1947, is at present of the opinion that there will not be a depression in 1947, even though there may be a "mild recession in business this fall."

Copper, Lead and Zinc Price Controls Revoked in Canada

During the past month the Canadian Government removed price controls on copper, lead and zinc. The price controls on scrap tin and tin alloys were not revoked. No export controls on non-ferrous metals have been amended or revoked.

ENGINEERING A SMALL JOB-PLATING SHOP

(*Concluded from page* 70)

it came to the cyanide copper, a slip was made.

There was a slight steam leak there. No noticeable trouble arose for several months. By then, however, the cyanide had chewed away the bronze bushing in the ground-joint union inside the tank and more and more copper solution found its way to the return and hence to the boiler. There it ruined, one by one, everything made of brass, such as the bellows of the pressure control switch, the safety valve, and what hurt most, three sets of condensate returning pumps. Eventually the problem was solved by running the returns from the copper and chrome tank to the sewer, instead of letting them go back to the boiler.

Much trouble was had with the 35 B.H.P. boiler too. The boiler is provided with a low-water-cut-off and pump control. This device is substantially two mercury tube switches mounted on a float at boiler-water-level. Following a slight variation in the latter, one mercury switch turns on the condensate returning pump. If, under abnormal conditions, the boiler-water-level goes too low, the other mercury switch tilts and shuts off the oil burner and sounds an alarm.

The electrician who hooked up this device connected it in series instead of in parallel, so that whenever the pump ran, the alarm also rang. He gave a gloomy report that "something is wrong," disconnected the alarm bell and left out the low-water disconnect.

The condensate returning pump has a strainer. Soon after operations began, this got clogged up with chips from the newly threaded pipes so that the condensate ran into the sewer through the overflow and no water was pumped back to the boiler. Since the low water alarm and cut-off were not operating, by the time it was noticed that something was wrong the boiler leaked like a sieve. Fortunately, it was a sturdy piece of equipment which was repaired at an expense of only $40.00 by expanding the tubes in the tube-sheet. Afterwards the connections were traced out and the hook-up corrected.

Truthfully, however, the writer is almost glad that these and other troubles were had because an engineer worth his salt is not happy if he does not know the inside story of all the machinery within reach, and unless there is trouble, there is no good excuse to take it apart.

Patents

Rust-Preventive Composition

U. S. Pat. 2,418,075. *Myron H. Kollen and Marcellus T. Flaxman, assignors to Union Oil Company, March* 25, 1947

An anti-rust composition comprising between about 5% and 95% of oil-soluble polyvalent metal tall oil soap and between about 5% and 85% of oil-soluble polyvalent metal degras soap.

An anti-rust composition comprising 50% to 85% lead tall oil soap, 5% to 30% lead wool grease soap, 5% to 10% paraffin wax, 5% to 10% lubricating oil and 0.01% to 0.1% of cobalt in the form of an oil-insoluble salt.

Rotary Abrading Tool

U. S. Pat. 2,417,645. *Elisha W. Hall, March* 18, 1947

In a rotary abrading tool, the combination of an annular body of textile abrading material, and a body of adhesive plastic encircled by and penetrating into said annular body, said abrading material being highly compressed in an annular zone about and radially outward beyond said body of plastic material and limiting such penetration.

Buffing Composition Manufacture

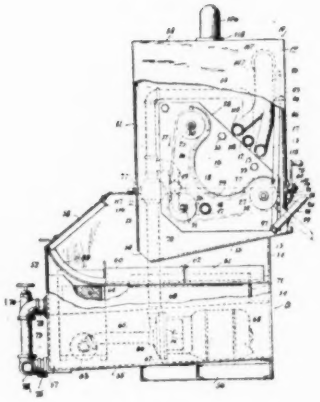
U. S. Pat. 2,417,800. *Arthur H. Weisser, March* 18, 1947

A method of making polishing and buffing composition bars, sticks, cakes and the like, comprising the steps of breaking up a mass of grease into small discrete solidified particles mixing abrasives and the grease in a relatively dry granular or powdered state and thereafter molding the mixture into a dense, homogeneous mass, solely with the application of pressure.

Cleaning Machine

U. S. Pat. 2,418,934. *Charles Hirsch, assignor to The American Foundry Equipment Company, April* 15, 1947.

A cleaning machine comprising in combination, a housing; a pervious belt guided in said housing for movement along a curved path so as to form



a tumbling trough in a space of air adapted to receive in said trough parts to be cleaned; a nozzle for discharging a jet of liquid into said trough from above; a nozzle for discharging a jet of liquid into said trough through said belt from underneath; means for supplying a liquid to said nozzles; means below said belt for collecting liquid passing through said pervious belt; and means for driving said belt.

Iron Plating

U. S. Pat. 2,418,970. *Louis J. Donroe, assignor to Pyrene Manufacturing Company, April* 15, 1947.

The process of electrolytically depositing iron and iron-nickel alloys which comprises electroplating through a solution containing ferrous sulfate where iron alone is deposited and ferrous sulfate and nickel sulfate where iron-nickel alloy is deposited, free sulfuric acid in an amount equivalent to from about 0.5 cc. to about 5 cc. per gallon of 66° Bé. acid, and a reducing agent consisting of zinc hyposulfite in an amount sufficient to reduce any ferric iron in the solution to the ferrous state.

Magnesium Electroplating Treatment

U. S. Pat. 2,419,190. *Harvey Eugene Wagoner, assignor to E. I. du Pont de Nemours & Company, April* 15, 1947.

The process for electroplating a metal selected from the group consisting of magnesium and alloys of magnesium which comprises contacting said metal with a bath comprising essentially a compound selected from the group consisting of monobasic unsaturated acids containing at least one double bond, aliphatic esters of said acids, and heavy metal salts of said acids at temperatures above about 100° C. but not higher than about 300° C., for a period of about 5 to 30 minutes, said compound being in the liquid state at the operating temperature, wiping said metal and thereafter electroplating said metal with a heavy metal selected from the group consisting of copper, zinc, cadmium, tin, silver, and gold, from an alkaline plating bath.

Rectifiier

U. S. Pat. 2,419,602. *Murray F. Skinker and Leslie B. Haigh, assignors to Federal Telephone and Radio Corporation, April* 29, 1947.

A rectifier comprising, in combination, a metallic base plate, a layer of selenium on said base plate, a layer of insulating material on said selenium layer, and having a small opening therethrough exposing a portion of the selenium layer, counter-electrode alloy extending through said opening to contact said selenium, a lead wire fused to said counter-electrode alloy, and a second continuous insulating layer extending about said base plate, selenium layer, first insulating layer and lead wire.

Electrodeposition of Iron

U. S. Pat. 2,420,403. *William B. Stoddard, Jr., assignor to The Champion Paper and Fibre Company, May* 13, 1947,

The process of obtaining smooth, fine-grained deposits of iron from an electrolytic bath consisting essentially of an aqueous solution of a salt from the class consisting of ferrous chloride and ferrous sulfate which comprises passing an electric current through the bath while maintaining therein, as a catalytic refining agent, at least one-tenth gram and not substantially more than twenty grams per liter of soluble manganese in the form of a divalent salt from the class consisting of manganous chloride and manganous sulfate, the pH of the bath being between 1 and 4.5 but not sufficiently high to cause a coarse grain structure of the deposited iron.

Tile Lined Tanks

U. S. Pat. 2,418,580. *John M. Crom, April* 8, 1947.

A method of constructing a liquid-resisting tile lined tank, which consists in erecting a tank-like form having

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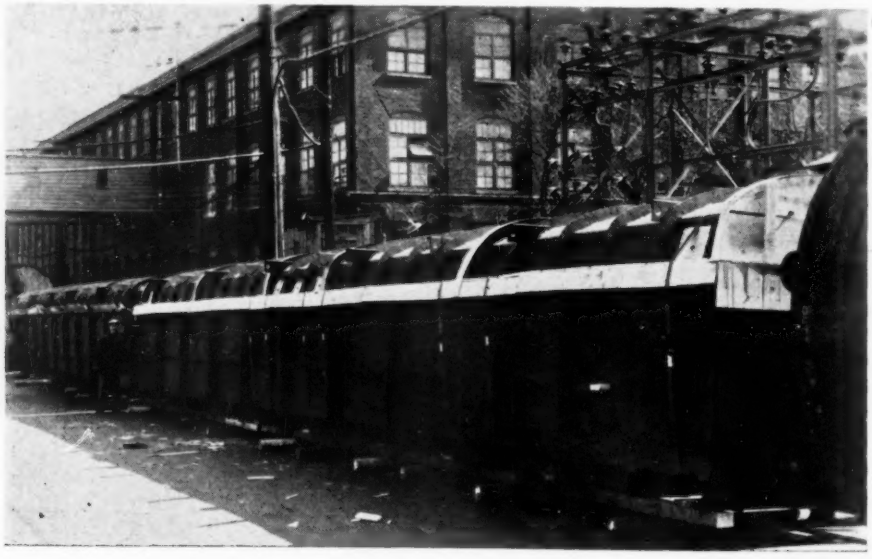

The longest rubber lined tanks believed ever to be shipped in one piece recently rubber lined by Raybestos-Manhattan, Inc. The two tanks were exported to a Brazilian steel mill to be used for a continuous strip pickle line. Each tank measured 62 ft. long, 7 ft. wide and 6 ft. high.

outwardly facing tile-receiving and supporting surfaces, mounting an annular layer of liquid-resisting tiles thereon in edge to edge relation wherein their combined inner faces provide the inner face of the tank wall, the tiles of said layer being spaced apart to provide a gap between horizontally adjacent tiles, projecting a layer of cementitious composition over and onto the combined outer faces of the tiles to a depth sealing the outer portions of the spaces between the tiles and providing a unitary wall extending about and in bonding engagement with the tiles, the gaps between the spaced tiles permitting free shrinkage of the wall, removing the form, packing the gaps between the tiles at and outwardly of their inner faces with liquid-resisting cement, and placing and holding the tiles tight and leakproof along the joints at said gaps by placing the tank under compression by the application of steel reinforcement circumferentially and under tension about the outer face of said wall.

Electroplated Articles

U. S. Pat. 2,419,231. *Donald H. Schantz, assignor to Standard Steel Spring Company, April* 22, 1947.

The method of plating articles with a nickel-zinc alloy which includes making the articles cathode in an electrolyte, having a pH between about 1 and about 3, in which nickel chloride and zinc salt of the group consisting of zinc sulphate and zinc chloride have been dissolved in sufficient amounts to give, to each gallon of the electrolyte, a metal zinc content of about 7 to 9 ounces and a nickel metal content of about 7 to 8 ounces, and passing a current having a density of 100 to 700 amperes to the square foot of cathode surface through the electrolyte to the articles.

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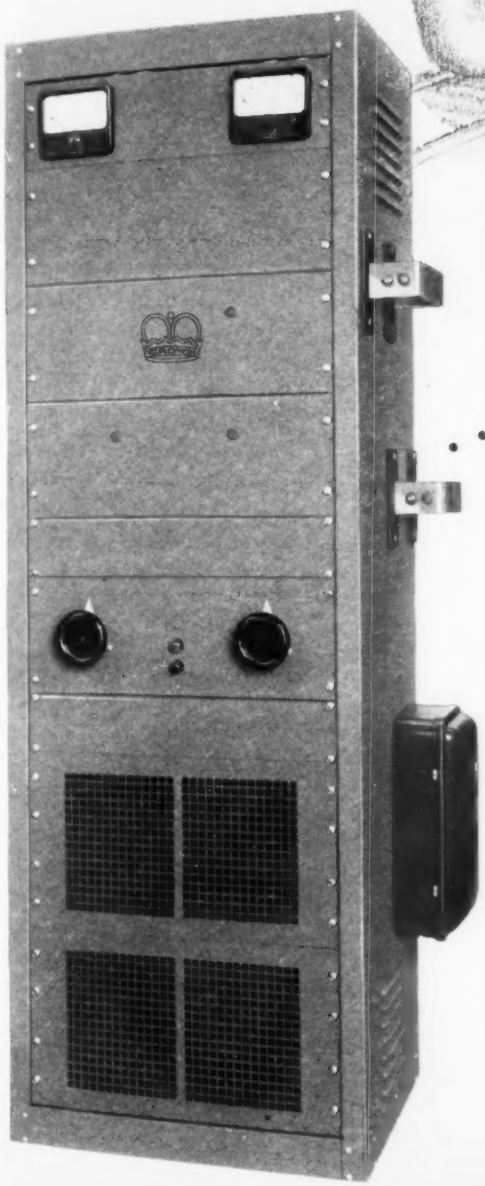

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Shop Problems

Abrasive Methods—Surface Treatments—Control
Electroplating—Cleaning—Pickling—Testing

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Brass Tarnish

Question: We are very much interested in obtaining a high, yellow lustre on brass castings by means of bright dipping. At present we are using two parts sulphuric and one part nitric acid. After dipping, however, our yellow brass castings have a tendency to turn red.

We dip our castings first in hot caustic soda solution; then comes the acid dipping followed by rinsing in cold water and placing castings in tumbling barrel. After removal from tumbling barrel and exposure to the atmosphere, some of the castings tarnish. What can we do to prevent tarnishing?

B. G.

Answer: To prevent the yellow brass castings from turning red, reduce the nitric acid content until satisfactory. To eliminate tarnishing in your castings, use a soap solution in tumbling barrel which will leave an anti-tarnish film on the surface.

Water Staining

Question: We have encountered a drying problem with a cake turner, which is a flat metal stamping approximately 3" x 4". When this is racked in a vertical position for nickel plating and drying purposes a drop of water collects on the lowest point and causes a stain to appear after drying. As we do not wish to rumble these articles in saw-dust we hope to find some chemical addition to our final rinse or some other mechanical or heating arrangement that would serve this purpose.

C. E. G.

Answer: We recommend that your rinse water be 190°-200° F. Shake the work well after rinsing and put in a plating drying oven. Addition agents in the final rinse may cause more trouble.

Gold Plating Streaks

Question: In plating with gold for bright finish my work comes out streaky. Could you advise me as to what I should do regarding this matter?

H. S.

Answer: We recommend that you reduce the current density and voltage, filter your solution and control the bath by chemical analysis.

Plating Zinc Die Castings

Question: We should like to have your recommendations on the set up of a typical line for the preparation, cleaning, copper plating and nickel plating of zinz die cast handles. We are now using a cyanide copper and bright nickel plating line for steel pieces. What changes must we make in the composition of our cleaners, acid dips, and copper solution to handle these die castings? How much copper must be deposited before nickel plating?

K. G. M.

Answer: First, the castings should be polished and buffed to secure proper smoothness and luster. If you do not plan on putting chrome or any other decorative coating on top of the nickel, it is recommended that you use a copper flash coat under the nickel; however, if you do cover the nickel, you can secure bright nickels that are cold and which deposit directly on the zinc basis metal in from 4 to 7 minutes without a copper undercoat. Properly insulated racks should first be secured, holding approximately 20 pieces per rack. After polishing and buffing, the work should be vapor degreased immediately to remove compound before it sets on the work. A storage space can be set up for the work ahead of plating; when work can flow, use soak cleaner for 1 to 2 minutes, thereupon in a weak alkaline die cast cleaner made anode for 30 to 45 seconds and thoroughly rinsed in running cold water. If copper plated, it can be flashed in high speed rochelle salt bright copper, rinsed thoroughly in cold water, and nickel plated; if no copper is used, place directly into the nickel for the required period from the cleaning rinses, after which it should be again rinsed and placed in either of the final coatings required. Hot or cold bright nickel baths may be secured from any reliable plating supply house.

Analysis Calculations

Question: It is not quite clear to me whether standard (0.5N) Sodium cyanide (NaCN) is the same as just standard NaCn, used to get metallic nickel factor, as shown on page 150 of the 1945 *Guidebook*.

J. M.

Answer: This is the same. Sodium cyanide, however, contains one half normal solution while in the second case it requires the number of cc. of one-half normal solution multiplied by the factor given.

Plating Non-Conductors

Question: We will appreciate your advising us as to what books you publish or recommend that will give complete information and the process for the electro-plating of non-metallic objects such as glass and plastics.

We would also like to know if silver and gold plating solutions have any tendency to lose any of their effective-

ness when not in use and stored for a period of time.

W. B. H.

Answer: Information on this subject is contained in "Metallizing Non-Conductors," by Samuel Wein, copies of which are obtainable from this office at $2 each, payable in advance.

Silver and gold plating solutions will decompose slightly upon standing and the cyanide content will decrease as a result. Upon replacement of the cyanide content, the solution should operate satisfactorily.

Silver Plating

Question: Would appreciate information if you have any publication on silver plating, formulas for solutions, stripping, etc.

A. H. X.

Answer: A standard silver plating formula is as follows:

Strike Solution

Silver Cyanide .6 oz./gal.
Sodium Cyanide 9 oz./gal.
Room temp., 6 volts, 15-25 amp./sq.ft.

Plating Solution

Silver Cyanide 4 oz./gal.
Potassium Cyanide 5.5 oz./gal.
Potassium Carbonate 6.0 oz./gal.
72-78 degrees F.; 5-15 amp./sq. ft. about 1 volt

Silver Strip from Brass and Copper Alloys

Sulfuric acid 19 parts by vol.
Nitric acid 1 part by vol.
Immerse at 180 degrees F. Keep water out.

Silver Strip from Steel and Die Castings

Sodium cyanide 4 oz./gal.
Reverse current 4 volts; use slightly warm.

Anode Information

Question: Do you have any information as to the sizes of Zinc and Brass Anodes used in the Plating Industry?

I. W. W.

Answer: Sizes and shapes vary; however, the average solid and single-piece zinc and brass anode used in the industry is elliptically shaped and is approximately 30" long, while in cross-section the major length is about 4" and the major width about 2". A great many zinc anodes are cast as balls about 2" in diameter each weighing 1 lb., and are used in the plating solution by use of a steel rack.

Electrolytic Polishing

Question: In reference to one of your articles in the 1945 *Plating and Finishing Guidebook* concerning electrolytic polishing of metals we would appreciate information as to the name of the inventor and date of issue of a patent on a solution for electrolytic polishing of copper and zinc U. S. Pat. 2,330,170.

J. J. E.

Answer: This patent was issued to *R. W. Manuel*, assignor to Crane Co., on Sept. 21, 1943. The complete requirements for current density, chemical composition and description of the anode is contained in the December, 1943, issue of *Metal Finishing* under Patents.

Plating Costs

Question: I am interested in determining the costs of electroplated finishes. Can you tell me what literature is available on this subject? An article concerning the cost of electroplated finishes at Westinghouse, written by Harold Farber, was published in *Metal Finishing* some time within the past five years. I am hoping that this article is available to me. The article to which I refer excludes the one he wrote in the April, 1945, issue of your magazine.

E. J. G.

Answer: An article by Mr. Farber appeared on page 213 of the June, 1936, issue of *Metal Industry*. We do not have any copies of this issue available and would suggest that you obtain photostats from the New York Public Library.

Hot Tin Dip

Question: Can you recommend a formula for a hot tin dip of wire baskets?

E. F.

Answer: We suggest that you clean and pickle the work, then immerse in the following solution:

Ammonia Alum, 300 parts
Melted Stannous Chloride, 10 parts
Warm Water, 20,000 parts

Immerse when solution boils. Add small amounts of tin salts as needed.

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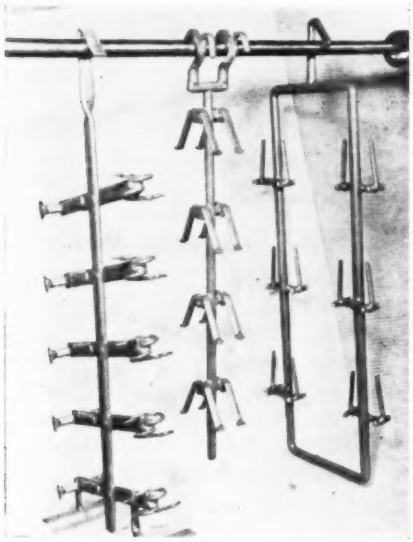
Rack and Tank Coating

A new vinyl type coating has recently been perfected by Heil Process Equipment Corporation for tanks and rack fixtures used in the plating and chemical industries.



The new coating designated as Heilex 445 (available as a lining also) has well defined resistance to chemicals and is noted for its tough surface and high bonding characteristics. Acids such as sulphuric, hydrofluoric, hydrochloric as well as nitric and chromic oxidizing acids are claimed to have no deteriorating effect.

Physically, this plastic is rubbery and tough. It resists abrasion and rough handling. If damaged by sharp objects it can be readily repaired on job site with a patching material supplied by Heil.

Another unique property of Heilex 445 is said to be the negligible effect of temperatures up to boiling. This broadens its usefulness to keep pace with the constant demand for faster, and in many cases, hotter processes.

The coating has been approved by manufacturers of nickel salts for bright nickel plating. It is stated to be giving good service on racks, stanchions, fixtures, tanks in copper, nickel and chrome sequence and protects the plating solution from contamination and the rack from corrosion.

A new technique for applying has been worked out by Heil engineers that results in a heavy elastic and abrasive resistant surface, with unusually tough bond hitherto considered difficult to achieve with like materials.

For information write Heil Process Equipment Corporation, Dept. MF, 12901 Elmwood Ave., Cleveland 11, O.

Rack Enamels and Stop-Off Lacquers

A complete line of Chemtite rack enamels and stop-off lacquers has been recently developed by the Maas & Waldstein Company, Newark, N. J., producers of lacquers, enamels, synthetics and specialized production finishes.

These rack enamels and stop-off lacquers are claimed to have unusually good adhesion and resistance in the acid and alkaline solutions employed in electroplating processes.

Self-Contained Dust Control Unit

The Kirk & Blum Mfg. Company, Dept. MF, 2859 Spring Grove Ave., Cincinnati 25, Ohio, is manufacturing a new self-contained dust control unit. This new unit is said to meet the needs of both large and small plants where layouts require the placing of one or more machines in buildings not served by the central dust control system, or in isolated parts of the main plant building.

This self-contained unit is unusually versatile; it can be set up anywhere to serve any machine for as brief or as long a period of time as needed. The unit will handle sawdust and shavings from woodworking machines, grinding, buffing and polishing dirt from metal working machines and all similar dust sources.

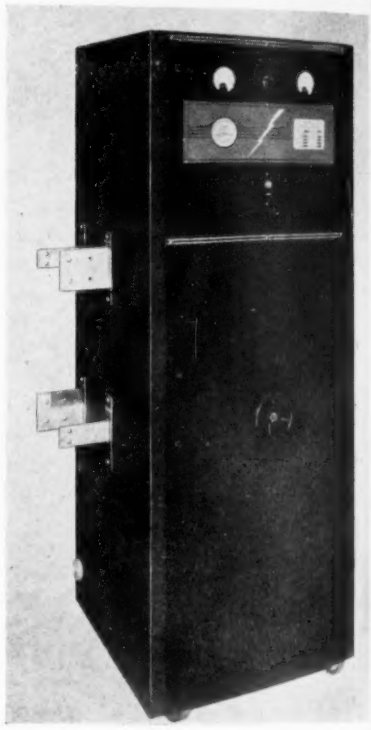
Exclusive features include an air volume of 900 cfm at 2″ suction, capacity for four 3″, two 4″, or one 6″ pipe connections; and a four cubic ft. storage compartment, in addition to being semi-automatic in its cleaning operation.

Kirk & Blum engineers stand ready to study problems relating to dust and fume control in plants anywhere in North or South America and to make qualified recommendations for designing systems to meet each individual need.

Tap Switch Rectifier Control

The Richardson-Allen Corporation has announced the addition of a complete line of selenium rectifiers with tap switch controls. Their line of selenium rectifiers with stepless variable controls remain intact.

Self-contained rectifiers which include basic rectifier, motors and shunt will incorporate tap switches for 6, 9 and 12 volts for 500 and 1000 amperes capacity; 6 and 9 volts for 1500 amperes, and combination 6/12 and 9/18 volts up to 1000/500 amperes capacity.



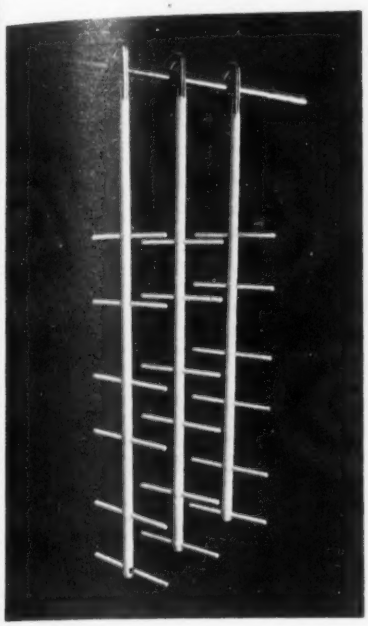
Separate remote controls will employ tap switches from 12 volts-500 amperes to 6 volts-5000 amperes.

A special 3 gang switch presents the added advantage of one control for making voltage adjustments. Voltage taps are in approximately one volt steps. The D. C. output current is not broken with tap switch controls.

For specifications write Richardson-Allen Corporation, Dept. MF, 15 W. 20th St., New York 11, N. Y.

Air-Dry Rack Coating

Air Dry Rack Coating 266, just announced by U. S. Stoneware Company, is claimed to cut the time required to apply air-dry rack coatings almost



75%. Most air-dry rack coatings are said to require 7 to 9 dips to build a coating sufficiently thick to provide any real degree of protection. With Rack Coating 266 two dips are usually ample.

Coating 266 is resistant to all plating solutions, including hot alkaline cleaners, according to the manufacturer, and requires only 20-30 minutes drying time per coat. Coating 266 possesses excellent adhesion to all surfaces, is flexible and resilient to withstand mechanical shock in handling, it is claimed.

For further information, write United States Stoneware Company, Dept. MF, Akron, Ohio.

Stop-Off Compound

A new stop-off lacquer, "Kote-Masq," has been announced by the Hanson-Van Winkle-Munning Company, Dept. MF, Matawan, N. J.

This product, the result of extensive research, embodies the latest synthetics now available to industry. Production tests are said to have proved its superiority, particularly in providing positive adhesion at the edges. Kote-Masq is recommended for use in any electroplating, electrocleaning or anodizing solution. It can be stored in the original shipping container or one of glass; not plain tinned or galvanized containers.

Kote-Masq consists of three separate materials; Kote-Masq—the actual stop-off compound, in the traditional orange color; Kote-Thinner—used to dilute the compound, if it should thicken before use; and the Kote-Thinner, Grade S—must be used when spraying, but for no other purpose.

The compound can be removed with a chlorinated solvent liquid or in a vapor degreaser.

Corrosive Solution Handling Utensils

A new line of unbreakable shop utensils for handling acids, alkalis, and other corrosive solutions is announced by Automotive Rubber Company, Inc., Dept. MF, 8687 Epworth Blvd., Detroit 4, Mich.

Manufactured from reinforced perforated metal, the utensils are completely covered with a 1/8" seamless rubber coating that protects them from action of chemicals and protects solutions from contamination. Coatings of soft or semi-hard natural rubber or synthetics may be had.

The line includes pails of 3 and 5 gallon capacity, a 2 quart dipper, 10" funnel and measures of 2, 4 and 6 quart capacity. Special sizes and shapes are

Applying insulation at the Standard plant, a dipping operation.

STAND-IT-ALL
Insulation

FOR COMPLETE PROTECTION ON EVERY STANDARD RACK

No power loss...no plating material loss...long plating rack life...these are the advantages of Standard's STAND-IT-ALL *flexible* insulation. This insulation, developed in Standard's own plant, is applied to every Standard rack to give the plating industry the complete protection that means an efficient, economical plating operation.

STAND-IT-ALL is typical of Standard's ability to build a better rack for your plating job. Our modern, completely equipped plant is devoted entirely to the production of a single product... plating racks that give you such features as replaceable tips, lowest maintenance costs and custom designing to fit your part.

You will be money ahead if you call on Standard, "the largest exclusive plating rack manufacturers."

STANDARD

STANDARD PLATING RACK COMPANY
1913-1925 North Paulina Street, Chicago 22, Illinois

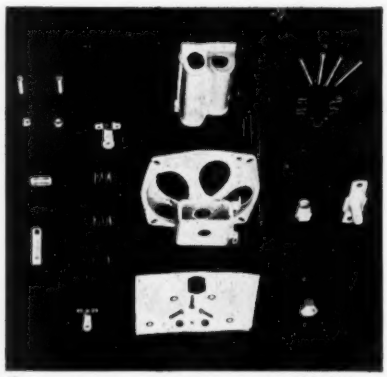
The New Miracle Finish
IRCO-Seal

● The IRCO-IZING PROCESS plus IRCO-SEAL is a complete metal preparation and finish in one operation.

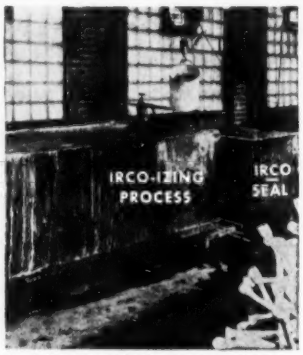
IT SAVES COST AND LABOR • EASILY SET-UP • SIMPLE TO MAINTAIN • IRCO-SEAL CAN BE DIPPED OR SPRAYED.

After the metal emerges from the IRCO-IZING bath, *it need not be dried before* application of IRCO-SEAL.

IRCO-SEAL is a satin-like organic finish, durable, *will not clog threads*, and dries rapidly.



● Above are some articles finished with IRCO-SEAL (Note the smooth finish and unclogged threads)
300 HOUR SALT SPRAY RESISTANCE



The IRCO-IZING PROCESS is a hot zinc phosphate treatment for iron, steel, zinc and cadmium, providing a rust inhibiting phosphate base for all finishes.

IRCO-SEAL is immediately available in the following colors:

- Bright metallic (Replaces Plating)
- Brown
- Mahogany
- Blue
- Black

INTERNATIONAL RUSTPROOF CORPORATION

IRCO PRODUCTS

CLEVELAND OHIO

available to specifications.

According to the manufacturer, this line is designed to make the handling of corrosive solutions safer because danger of breakage is completely eliminated.

The line is illustrated and more completely described in Catalog Sheet Number 120 which may be obtained by writing the manufacturer.

Tube Support Stand

More uniform polishing and more efficient handling of long tubing on semi-automatic tube polishing machines is said to be afforded by Presto Tube Support Stands, developed by The Manderscheid Company, Dept. MF, 810 Fulton St., Chicago 7, Ill.

The tubing rests on two rubber wheels located on top of the tube support stand. By adjusting the angle of the wheels, the movement of the tubing across the polishing wheel or abrasive belt can be regulated to the required speed. Holds tubing from $\frac{3}{4}$" to 5" in diameter and is adjustable from 28" to 38" high.

Descriptive literature on request by writing to the firm as above.

Cleaner for Aluminum

A new metal cleaning compound especially designed for cleaning aluminum, designated as Optimus No. 101A, has just been announced by Optimus Detergents Company, Dept. MF, 101 Water St., Matawan, N. J., manufacturers of industrial cleaning materials.

Optimus No. 101A is a balanced blend of medium duty alkaline cleaner, including special water softening materials and inhibitors to prevent attack on the metal. It is said to be particularly effective for cleaning dirt, grease and oil.

It can also be used as a soak cleaner for ferrous metals other than aluminum, such as die castings, brass, bronze, pewter, etc. In this application, the work can be made the cathode and cleaned electrically. With aluminum, the electro-cleaning application does not apply.

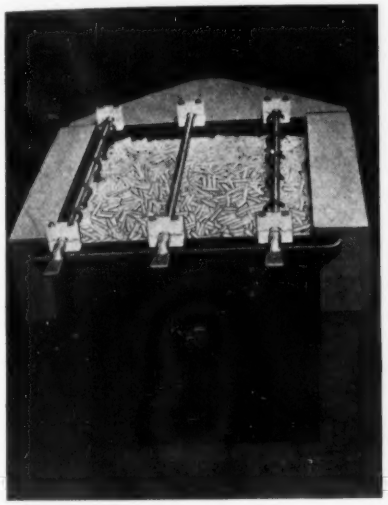
Optimus No. 101A includes a synthetic wetting agent. It is stated to be ideal for hot tank applications. A very

mild, non-etching type of cleaner, it can be used in small concentrations, with temperature ranging between 140° and 180° F.

A similar material, and a companion product, Optimus No. 101 is applicable for machine washing operations, where the presence of foaming is undesirable.

Chrome Spray Floats

In order to minimize chromic acid loss, reduce heat waste and help protect workers, the Hanson-Van Winkle-Munning Company, has developed Chrome Spray Floats for use in chromium plating tanks. These floats are laid on the solution to a thickness of



about one inch, forming a blanket which cuts escaping spray to a minimum. Also, the floats are said to help keep the heat inside the tank, thus conserving the supply of chromic acid. H-VW-M Chrome Spray Floats are, moreover, an effective auxiliary to ventilating systems, it is claimed.

The floats are yellow polystyrine tubes, 2¾" long, completely enclosed, and will float on the surface of the solution. Approximately ½ lb. per square foot of solution surface area are required. They are practically indestructible and can be used indefinitely. They do not adhere to or interfere with the work in the tank.

For information write Hanson-Van Winkle-Munning Company, Dept. MF, Matawan, N. J.

Plastic Finish Protection

"Rubba-Coat," a non-inflammable liquid rubber-plastic which can be sprayed onto highly polished metal parts to protect them from dirt, rust, corrosion, moisture, fingerprints and smudges, is being introduced to industrial users by its manufacturers, Rubba, Dept. MF, 1015 E. 173rd St., New York, N. Y.

Highly polished metal parts which are protected by this unusual coating can be handled and abused by an entire production line, yet when the coating is peeled off in the shipping department, the metal shows its original high lustre, it is claimed. "Rubba-Coat" can also be applied to painted wood subassemblies to protect the paint finish as the completed product takes shape.

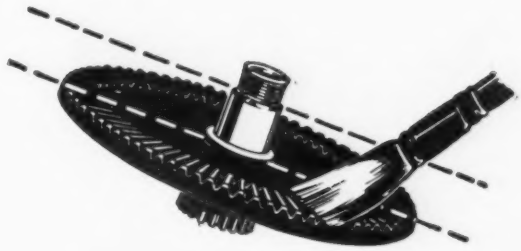
The new protective compound has many interesting properties. It is claimed to be non-inflammable, waterproof, can be easily applied by brush, spray-gun, or dip method and can be removed by peeling, like the skin of a banana. It dries quickly and remains permanently flexible so that metal sheets can be formed without breaking or cracking the skin.

Anti-Corrosive Coating

"Zincilate," an anti-corrosive process which is claimed affords 20 years protection to ferrous metals against all common corrosive forces, has been announced and introduced to United States and world markets. The material is being used on pipelines, on the interiors and exteriors of water and gasoline tanks and bridges, on machine parts, and on marine installations where is is said to give not only anti-corrosive but also anti-fouling service.

The new product is claimed to be unaffected after 1,000 hours' exposure

UNICHROME stop-off lacquers



Help you do a better job . . . in less time!

EASILY APPLIED—by brushing, spraying or dipping—these tough synthetic lacquers assure clean-cut edges, withstand hot cleaners and acid dips, and will not contaminate plating baths.

FAST DRYING—in 5 to 10 minutes, at room temperature.

QUICKLY REMOVED—by peeling off or dissolving in remover solution, depending on type of stop-off used.

Stop-off 322 (Black) Extra adherence for severe cycles, including hot cyanides. Removed by dissolving in Remover 322-RA.

Stop-off 323 (Red) For Chromium and other moderate-temperature cycles. Readily peeled off at room temperature.

Stop-off 324 (White) For all high temperature solutions. Resists hot alkaline cleaners, vapor degreasers for limited time. Easily peeled off while warm.

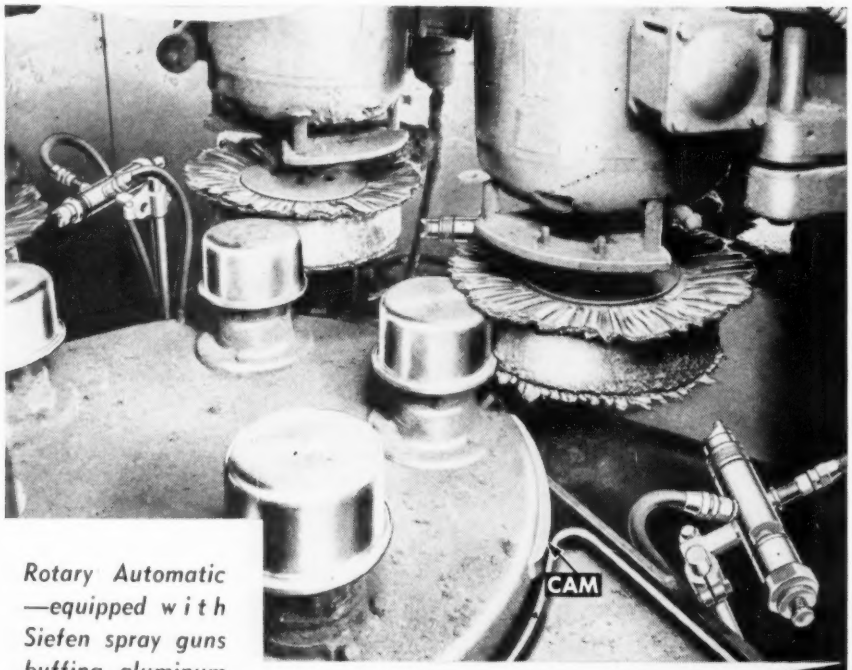
UNICHROME

Trade Mark Reg. U. S. Pat. Off.

STOP-OFF LACQUERS—Products of

UNITED CHROMIUM, INCORPORATED • 51 E. 42nd St., New York 17, N.Y.

Detroit 7, Mich. • Waterbury 90, Conn. • Chicago 4, Ill. • Dayton 2, Ohio • Los Angeles 11, Cal.



Rotary Automatic —equipped with Siefen spray guns buffing aluminum pans.

FOR MIRROR FINISH . . . . . Siefen

Buffing Nu Spra Glu

BUFFING Nu Spra Glu, a grease and abrasive mixture, sprays to wheel, cuts compound consumption in half and buff wear one third. Available in emulsion or oil-base types.

For satin finish—Nu Spra Glu. A liquid cold glue and abrasive mixture that dries instantly when sprayed on a revolving wheel.

★

AND REMEMBER— **NU GLU is a liquid cold glue for setting up polishing wheels.**

J. J. SIEFEN COMPANY

5627 LAUDERDALE • DETROIT 9, MICH.

in standard salt fog corrosion equipment, as approved by the American Society for Testing Materials; maximum specifications for the Army and Navy require 200 hours of salt spray exposure.

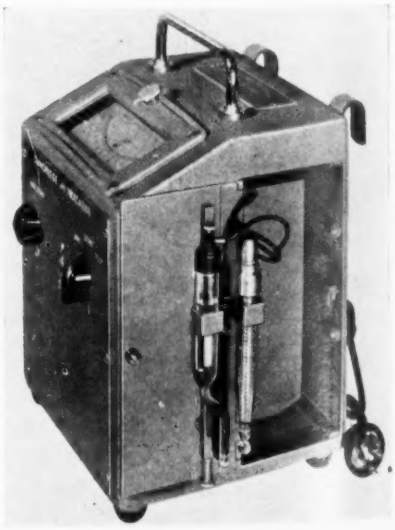
The new coating is a product of Industrial Metal Protectives, Inc., Dayton, Ohio. An affiliated company, Industrial Metal Protectives Corp. of Newport News, Virginia, will be the initial producers of this product.

The first of ten contemplated manufacturing plants in the United States is being established at Newport News, Virginia. Other cities designated for plant locations are Pittsburgh, Birmingham, Chicago, Seattle, Los Angeles, San Francisco, St. Louis, Houston, Hartford and Denver, and establishment of other manufacturing plants is now being negotiated in all of the important steel producing and consuming countries in the world. Treatment plants for the application of new protective film are being established at various strategic points in the United States and abroad.

Direct-Reading pH Meter

Unique design and rugged construction are features of the new industrial model direct-reading pH meter for measuring acidity and alkalinity announced by Cambridge Instrument Company, Dept. MF, 3203 Grand Central Terminal, New York 17, N. Y.

As a laboratory instrument it can be used at a bench or table for tests of small samples. As a portable instrument for making spot-checks, its weight of only 10 lbs. and the mounting of the electrode system as an integral part of the meter, make it convenient to carry. And as a continuous indicator



directly on processing operations, the meter can be suspended over a vat or tank, hung from a rack, or mounted on a wall. On such processing applications it can be used directly in grounded solutions as the glass electrode is completely shielded; extra-length lead wires can be furnished to permit use of electrodes at any desired distance from the meter.

Batteries have been completely eliminated, operation is from any 110-volt 50 or 60 cycle A.C. outlet; a voltage-regulator corrects for fluctuations from 100 to 130 volts. High stability has been obtained through improved design of electronic circuit and galvanometer; recalibration will seldom be needed oftener than once a week. Compensation is automatic for variations from 0 to 100° C. in solution temperature and for changes in room temperature. The clear scale is set at an angle at the top of the metal case so pH values can be read at a glance. Accuracy is claimed to be .10 pH over the instrument's full range of 0 to 14 pH.

Business Items

New Research Chemist for Enthone

Dr. Walter Meyer, president of *Enthone, Inc.*, has announced the appointment of *Hubert M. Goldman* as research chemist.

Mr. Goldman received his B.S.E. in Chemical Engineering from The Col-

Hubert M. Goldman

ONE ALWAYS STANDS OUT!

In the field of metal cleaners,
Wyandotte Porenac is an unequaled performer.

Prepared especially for the removal of drawing lubricants prior to pickling in porcelain enamel plants, Wyandotte Porenac emulsifies the toughest mineral oil compound with speed, economy and certainty.

The superior action of this balanced formulation eliminates the necessity for pre-cleaning, and thus greatly reduces over-all cleaning time. Its concentration requirements are low—its life in solution remarkably long.

Important, too, are the free rinsing qualities of Wyandotte Porenac, which prevent contamination of solutions in subsequent operations.

Wyandotte Porenac is of such versatility that it probably can be adapted to *your* specific problem, whether it be cleaning prior to porcelain enameling, barrel-plating, oxide finishing or other heavy-duty cleaning operations.

Your Wyandotte Representative will gladly tell you more about this and other Wyandotte Metal Cleaners. A call will bring him.

Wyandotte
REG. U. S. PAT. OFF.

SERVICE REPRESENTATIVES IN 88 CITIES

WYANDOTTE CHEMICALS CORPORATION, Wyandotte, Michigan

Stop Off— for hard chrome

BUNATOL
No. 474 RED

The low priced Stop Off that was used on so much War work.

Heavy, brilliant red for contrasting color. Use with a brush or by dipping.

Excellent adhesion and trims to a knife edge; and holds the edge. Stays where it's put and does not bridge on drying.

Stands up on difficult hard chrome jobs to save time, and trouble. No creep or plate through.

Strip by soaking in hot alkali solution.

May we send you a sample?

NELSON J. QUINN COMPANY
TOLEDO 7, OHIO

BUNATOL

C. W. Yerger

lege of Engineering at the University of Michigan in February, 1938. He was employed at *The Norma-Hoffman Bearings Corporation* of Stamford, Conn., from 1938 to 1945 as research chemical engineer and plating supervisor. During 1945 and 1946, he was employed as technical director at the *Connecticut Metal Finishing Company*, Hamden, Conn. He has been actively engaged since 1939 in practical electroplating and electroplating research with particular emphasis on hard chromium plating.

He is past-president and member of the board of managers of the Bridgeport Branch of the *American Electroplaters' Society*. Member of American Chemical Society, Electrochemical Society and Alpha Chi Sigma Professional Fraternity.

Mr. Goldman will work on the development of new products for Enthone, Inc.

Lupomatic Industries, Inc. Organized

Lupomatic Industries, Inc. has been organized to take over the operations of the former *Lupomatic Tumbling Machine Co., Inc.* which was established in 1906. The offices and plant will remain at 4501 Bullard Ave., the Bronx, New York, N. Y. *Charles W. Yerger*, well known for many years in the plating and finishing field, is president and treasurer. *Joseph Lupo*, who continues with the company as vice president, will have charge of development and research. *E. F. Helwig* is secretary.

The new firm plans an extensive expansion program with the introduction of new engineering features to improve and round out its previous line of equipment and supplies. It will continue to specialize in barrels for finishing and polishing, tumbling compounds and processes for the finishing of metals and plastics through tumbling. The expansion program includes the establishment of distributors throughout the country and an efficient administrative organization at the factory in an effort to improve service to the entire industry.

Pennsalt Announces $3,500,000 Power Improvements

The *Pennsylvania Salt Manufacturing Company* announced it now has under construction at its Wyandotte plant additional boilers and allied generating equipment, including a completely new modern power plant building, at a cost of more than $3,500,000.

In addition to new equipment, Pennsalt is installing fly ash collectors for the present three large pulverized-coal burning boilers at an estimated cost of $200,000. The new boilers also will be equipped with the fly ash collectors. These collectors, made by the Western Precipitation Corp., will remove solid products of combustion in the flue gases in an amount equal to or better

than existing municipal requirements. Engineers and constructors for the new plant and equipment are *Ford, Bacon and Davis, Incorporated,* of Philadelphia and New York.

Northwest Building Program to Expand Floor Space

"Preparing for the time when materials will again be available in quantities to satisfy demand," says *H. J. McCracken,* president of *Northwest Chemical Company,* 9310 Roselawn, Detroit 4, Mich., "We have set up a building program that when completed will increase our floor space area thirty-three and one-third percent. We first bought our present plant in 1942, doubled its size in 1944, and now with this latest addition which will be equipped with special machinery built to our design for the compounding of *Superdraw* formulae—it will also provide us with facilities to take care of several new products that have come into great demand."

Richardson Allen Appoints Rectifier Engineer

Richardson - Allen Corporation announces the appointment of *Warren Master* to their engineering staff as rectifier engineer.

Mr. Master received his E. E. degree from Lehigh University, and during the past 20 years has been engaged in the development of special electro-mechanical devices and equipment for

Warren Master

the utility, industrial and aviation fields.

For several years prior to his present connection, Mr. Master was associated with *Federal Telephone and Radio Corporation* as development engineer on selenium rectifier equipment. In his new position he will continue his developmental work for the Richardson-Allen Corporation Rectifier Division on closely-regulated D-C power supply equipment.

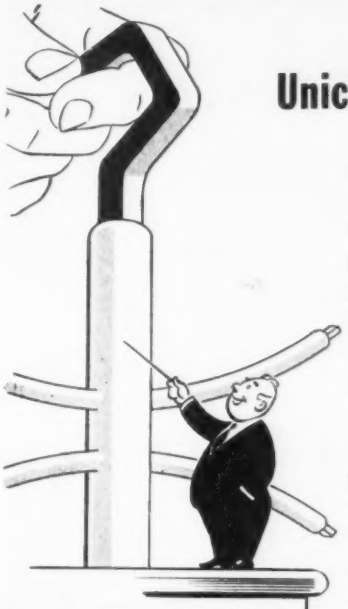
Pennsalt Names Two Assistant Production Managers

C. S. Beldin, production manager of the *Pennsylvania Salt Manufacturing Company,* has announced the appointment of *Francis E. Murphy* and *Henry G. Meyer* as assistant production managers.

Mr. Murphy was formerly director of development at Pennsalt's Whitemarsh Research Laboratories. His new work will cover chiefly the technical aspects of manufacture, Mr. Beldin said. Mr. Meyer was formerly assistant to the production manager. His work, while technical, will be chiefly concerned with the statistical aspects of manufacture.

Mr. Meyer, a graduate of New York University with the degree of Bachelor of Science in Chemistry, joined Pennsalt in 1933. Before coming to the central office he was chemist, chief chemist and then superintendent at the Greenwich plant. He is a member

RACK COATING LASTS 3 YEARS!



A 3-year bath in nickel and chromium—Coating 203 sure can take it!

Unichrome Coating 203 serves record number of cycles

RACKS are kept busy in this plant. Yet this plater found he could practically forget rack maintenance once his racks were protected with Coating 203. He reports that in constant service in nickel and chromium tanks, *they averaged better than 3000 hours!*

That's trouble-free service for you! And consider the savings in recoating costs—and in time—that you can gain with Unichrome Coating 203. A *tough,* air-drying coating, it takes not only severe plating baths, but rough shop handling as well. Write your nearest United Chromium office for prices and details.

UNICHROME

Trade Mark Reg. U.S. Pat. Off.

RACK COATINGS—Products of

UNITED CHROMIUM, INCORPORATED • 51 E. 42nd St., New York 17, N.Y.

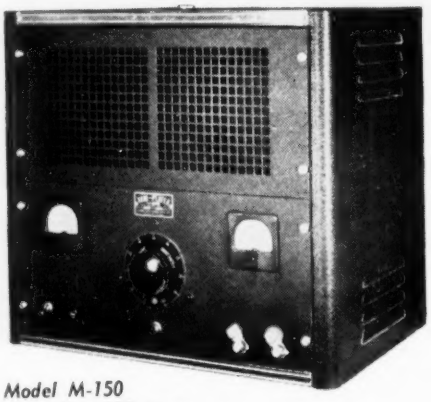
Detroit 7, Mich. • Waterbury 90, Conn. • Chicago 4, Ill. • Dayton 2, Ohio • Los Angeles 11, Cal

FOR BETTER PLATING . . . AT LOWER COST

It's the **VARI-PLATER***
PACKAGED INDUSTRIAL RECTIFIERS

★ VERSATILE
★ VARIABLE DC VOLTAGE
★ INSTANTANEOUS DC POWER
★ EXTREMELY COMPACT
★ STURDILY CONSTRUCTED
★ SIMPLE TO INSTALL
★ ECONOMICAL TO OPERATE
★ EASY TO MAINTAIN
★ FULLY GUARANTEED

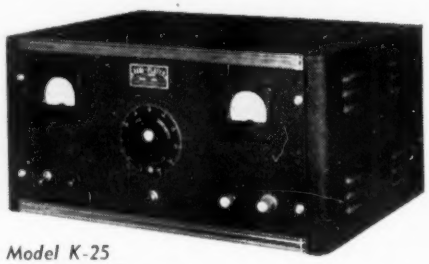
For laboratory and production work Lewis Electric offers a complete line of portable packaged industrial rectifiers ranging in output from 8 volts 25 amps to 8/16 volts 500/250 amps, and in size from 10½" x 21" x 15" deep to 42⅞" x 22" x 18" deep.



Model M-150
0-8 volts—150 amps
Model MD-150
0-8/16 volts—150/75 amps

*REG. TRADE MARK

FOR MORE INFORMATION WRITE TODAY FOR YOUR FREE COPY OF "LEWIS RECTIFIERS FOR ELECTRO-PLATING."



Model K-25
0-8 volts—25 amps
Model K-50
0-8 volts—50 amps

FOR PLATING

- GOLD
- SILVER
- CHROMIUM
- NICKEL
- BLACK NICKEL
- COPPER
- CADMIUM
- BRASS
- BRONZE
- COBALT
- IRON
- LEAD
- PALLADIUM
- RHODIUM
- TIN
- ZINC
- ALLOYS
- *On Metals and Non-Metals.*

LEWIS ELECTRICAL MANUFACTURING COMPANY
1266 GUN HILL ROAD, NEW YORK 67, N. Y.

of the Engineer's Club of Philadelphia.

Mr. Murphy attended Villanova College and graduated from St. Joseph's College in Philadelphia with a degree of Bachelor of Science in Chemistry. He joined Pennsalt in 1943 and formerly was with the *General Chemical Company* and the Golden Gate Bridge and Highway Department. A resident of Florence, N. J., he is a member of the American Chemical Society and American Institute of Chemical Engineers.

L'Hommedieu Announces Building Expansion

Arthur L'Hommedieu, president of the *Charles F. L'Hommedieu and Sons Company* has announced an addition to their present plant in Grant Park, Ill. No definite building plans have been determined as yet, but erection will take place on approximately 17 acres of land recently purchased.

The company has a branch office in Los Angeles, Calif., and Cleveland, Ohio, as well as representatives in many cities handling a complete line of plating equipment and supplies.

Optimus Detergents Appoints W. C. Thiess

William C. Thiess, of Philadelphia, has been appointed field service representative by *Optimus Detergents Company*, 132 Main St., Matawan, N. J., manufacturers of industrial cleaning materials. He will cover Philadelphia and Baltimore areas.

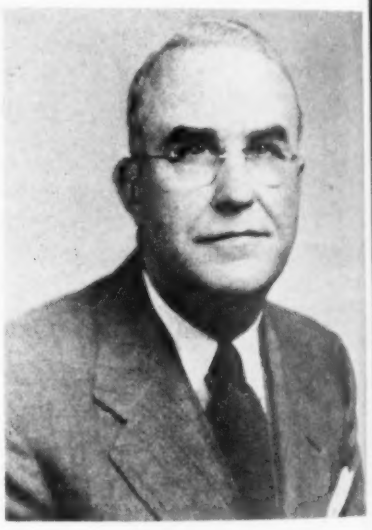
Mr. Thiess has had an extensive experience in the industrial cleaning field,

William C. Thiess

having formerly represented *Oakite Products*, and more recently been a member of the staff of *Detrex Corporation*.

Wyandotte Chemicals Shifts One, Adds Two in Industrial Dept.

Wyandotte Chemicals Corporation, Industrial Department, announces the



James Poulson

following changes in their sales staff:

James Poulson has been shifted to the Pacific Coast, with headquarters in the Los Angeles Office of the Wyandotte Organization. Mr. Poulson has serviced Wyandotte industrial accounts in the Milwaukee Territory since 1938. Previous to this he spent 7 years with two nationally known oil companies and ten years as a partner in a manufacturing business which produced polishing compounds and solvent cleaners. Mr. Poulson may be reached through the Seattle, San Francisco,

Lawrence E. Glynn

and Los Angeles Offices of Wyandotte Chemicals Corporation.

Lawrence E. Glynn has been serving Detroit area Wyandotte industrial accounts for over a year. For four years he was plant metallurgist, aviation division, *Chevrolet Motor Car Company*, in charge of plating and heat treating process control. Both *Charles Beaubien*, veteran Wyandotte Indus-

Robert J. Racine

trial Department Representative and Glynn are native Detroiters. Mr. Glynn is a member of the American Society of Metals and the American Electroplaters' Society.

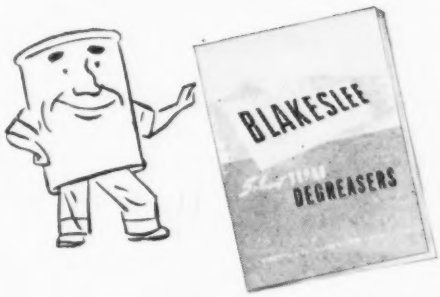
Robert J. Racine replaced Jim Poulson as Wyandotte Industrial Department Representative in Milwaukee, and has been in this territory about a year. He joined Wyandotte Chemicals following 29 months with a combat engineering battalion in the Pacific operations. Mr. Racine received his technical training at Michigan College of Mining and Technology. Before being assigned to Milwaukee territory he was given practical field experience in Wyandotte industrial operations in several territories.

CLEAN and SMOOTH

METAL PARTS COME OUT FREE OF GREASE OR CHIPS WHEN CLEANED IN A

BLAKESLEE

SOLVENT *Vapor* DEGREASER



Blakeslee Solvent Vapor Degreasers employ a patented degreasing process . . . parts made of metals and alloys chemically cleaned and dried in only a few seconds . . . no need for subsequent rinsing and drying operations. Oil and grease-free surfaces are obtained, complete oil removal from cracks, pores, seams and hidden crevices of machined parts, stampings, assemblies, etc., is assured. Masses of nested parts are thoroughly cleaned and dried throughout.

In this cleaning process, the oils and greases are dissolved by BLACOSOLV, the efficient degreasing solvent which can be used on all metals or combinations of metals. BLACOSOLV is non-inflammable and non-explosive.

Write today for FREE booklet on Degreasers and applications with Blacosolv, the all-purpose degreasing solvent.

G. S. BLAKESLEE & CO.

BLACOSOLV DEGREASERS AND SOLVENT

NIAGARA METAL PARTS WASHERS

G. S. BLAKESLEE CO., CHICAGO 50, ILLINOIS
NEW YORK, N. Y. TORONTO, ONT.

Howard L. Wright Transferred

Howard L. Wright joined the *Hanson-Van Winkle-Munning Company* about a year ago after graduation from Franklin and Marshall College and then a period of service as a Lieutenant in the Navy. Mr. Wright has now been transferred from the Philadelphia to the Syracuse, N. Y. office of the company and is making his headquarters at 313 Baker Ave., Syracuse 5, N. Y.

Capital Plating Works Is Incorporated

Incorporation of the *Capital Plating Works, Incorporated*, and the *Caplate Realty Corporation*, both of 761 Broadway, Albany, N. Y., was recently re-

CHROMIC ACID

99.75% PURE

With two complete, independent plants at Jersey City and Baltimore, and over a hundred years of technical background, Mutual is the world's foremost manufacturer of Chromic Acid.

MUTUAL CHEMICAL CO. NEW YORK

OVER A CENTURY OF CHROMIUM CHEMICAL PROGRESS

Bichromate of Soda
Bichromate of Potash

MUTUAL CHEMICAL COMPANY OF AMERICA
270 MADISON AVENUE NEW YORK 16, N.Y.

HARRISON 4A COMPOUNDS

for STAINLESS STEEL CARBON STEEL

give complete satisfaction—

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HAVERHILL, MASS.

ported by the New York Department of State.

The first firm has taken over the business of the Capital Plating Works from the estate of the late *Joseph Bertrand*, who died last December. The second corporation has taken over real estate holdings at 761 and 763 Broadway from the Bertrand estate.

The two corporations will continue to operate the business of the Capital Plating Works that has been kept in operation by the Bertrand estate since the death of Mr. Bertrand. The firm engages in the plating of all metals.

Both of the corporations are authorized to issue 200 shares of stock with no par value. Directors and subscribers are listed as *Arthur Kuperberg, Frank P. Bucci* and *Samuel H. Levine*. Mr. Bucci is a former employee of the Capital Plating Works.

H-VW-M Sets Perfect Safety Record

The *Hanson-Van Winkle-Munning Company*, Matawan, N. J., was awarded a certificate in recognition of its record of having no lost time accidents from October 1, 1946, to December 31, 1946, by the New Jersey State Department of Labor at a dinner held by that department at the Hildebrecht Hotel, Trenton, N. J., Tuesday, March 25th, to celebrate the New Jersey Annual State-wide Interplant Safety contest.

State of New Jersey

Statewide Interplant Safety Contest

The Department of Labor

Certificate of Merit

awarded to the Management and Employees of

Hanson-Van Winkle-Munning Co.

for their unremitting diligence in achieving a perfect Safety Record

H-VW-M reports that this perfect record has been continued through January, February, and March, 1947. The company has a very active Safety Committee who are making every effort to reduce accidents to the barest minimum, carrying on a permanent campaign of education among all of the employees. This committee consists of *C. L. Batchelor, Ross Kotaling, Joseph Wachter, Thomas S. Byrne, Donald*

Weir, Warren Wilkinson, Jacob Vreeland, Richard Gillis, James Flatley, Jack Gough and *William Turner.*

Davis-K Moves to Larger Quarters

Announcement is made by *Mr. J. F. Davis* of *Davis-K Products Company*, 114 Lexington Ave., New York, N. Y., that the firm has moved to enlarged quarters at 54 W. 22nd St., New York 10, N. Y.

The firm is a supplier of precious metal plating solutions and salts, especially gold and rhodium. The move was made, according to Mr. Davis, in order to better serve the many users of their products as well as take care of the increased volume of business.

Jackson Reports German Abrasive Methods

Germany is 15 to 20 years behind the United States in techniques of manufacturing abrasives, according to *J. T. Jackson*, president of the *Mid-West Abrasive Company*. Jackson and his brother, *L. P. Jackson*, vice-president of Mid-West, recently returned from a Government-sponsored tour of abrasive plants in the British and American occupation zones of Germany.

Despite certain evidences of technical advances in other industries, Jackson said, there was complete absence of similar strides made in abrasive production methods. The outstanding skill of individual German workers, however, does much to make up for their lack of advanced production machinery, Jackson declared.

Tools in most plants were crude and would by American standards be rated obsolete, yet these exceptionally skilled workers were able to turn out wheels that compared favorably with the best produced in the United States, Jackson said. He explained that most German workers spend many years of apprenticeship, so that when they reach the status of master craftsmen they have learned their trade thoroughly and well.

The craftsmanship attitude of most German workers is strikingly evident to the American visitor. It has survived the war's tremendous destruction and the long delays of resumption of production caused by debate as to how far the former aggressor nation should be permitted to go.

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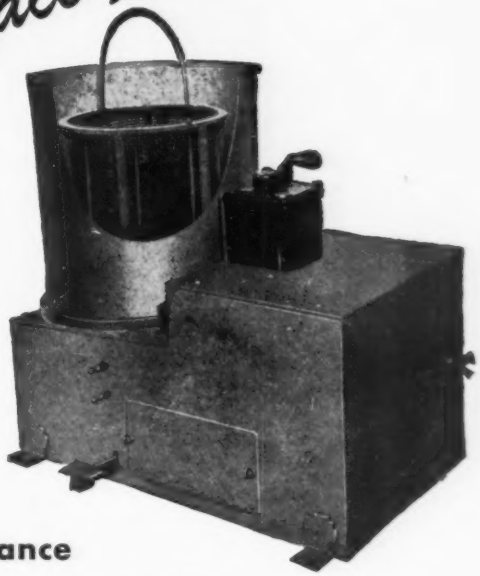

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The Kreider Dryer is compact, requiring minimum floor space. Equipped with ¾ HP motor, V-belt drive, foot-brake and reversing drum switch. Steam or gas auxiliary heating units are optional.

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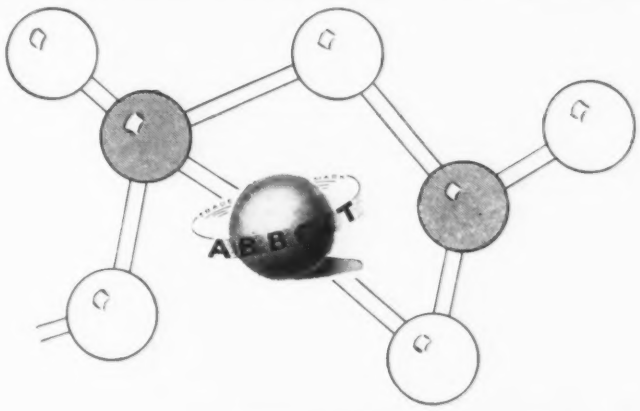

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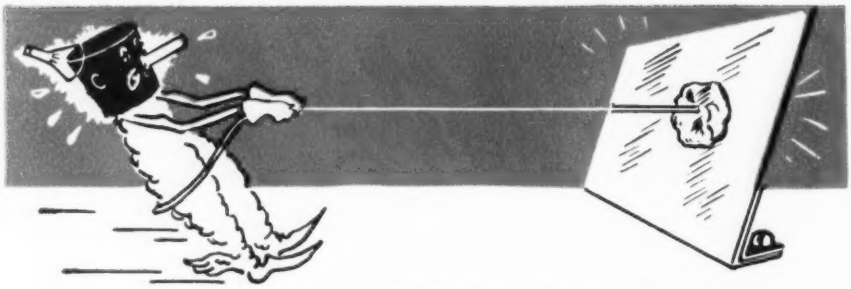

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Metal Finishing July

Manufacturers' Literature

Motor Generator Installation Instructions

A new bulletin, C5-17, has been issued by the *Hanson-Van Winkle-Munning Company*, Dept. MF, Matawan, N. J. This bulletin covers unpacking, installation, preparation of foundations, preparation for starting of the motor generator sets, care and operation, commutator maintenance, fitting new brushes, electrical maintenance equipment, copper requirements for electroplating busbar installations and diagrams of connections for induction and synchronous motor-generator sets.

Selenium Rectifiers

Two new bulletins have been recently released by *Richardson-Allen Corporation* to augment their loose leaf catalog on selenium rectifiers.

One covers their new automatic electronic voltage regulator and gives complete description and illustrations of this table size automatic regulator which maintains a constant D. C. output voltage regardless of the ampere load current and is designed for 115 volts, single phase 50/60 cycle A. C. input; the second covers the general line of all purpose industrial rectifiers, adaptable for all types of current rectification from AC to DC for general industrial uses, supplying any conversion voltage for any current load. The bulletin illustrates various sizes and types and gives specifications and applications. To obtain a copy write Richardson-Allen Corporation, Dept. MF, 15 W. 20th St., New York 11, N. Y.

Filtration in Electroplating

The importance of filtration as an aid to finer finished plated work from plating solutions is described and illustrated in a new catalog entitled, *Alsop Sealed-Disc Filters for Plating Solutions* which has just been issued.

This new catalogue contains 50 carefully chosen photos and diagrammatic views and 4500 words describing *Sealed-Disc* filters and *Centri-Poise* Pumps in complete detail as well as explaining the fundamentals of filtration for plating applications.

The text outlines the standard techniques widely employed today in plating departments, describes the distinct advantages of using filters in various plating installations and on practically all types of plating solutions. It shows also various types of typical installations in different plants.

Metal Finishing Folder

A new folder entitled *You Can Get Them All at Pyrene* listing diversified metal finishes available on either a job or contract basis is being distributed by the *Metal Finishing Division, Pyrene Manufacturing Company*, Dept. MF, 560 Belmont Ave., Newark 8, N. J. Processes include *Alumilite*, plating on

aluminum, *Bonderite*, cadmium plating, copper, chromium and hard chromium plating, *Cronak*, enameling, *Iridite*, lacquering, lead plating, special chemical treatments for magnesium, *Pyrene Bright Nickel*, *Parco Lubrizing*, *Parkerizing polishing*, *Pylumin*, *Pyron*, sandblasting, special electrolytic and chemical finishes, tin and zinc plating.

Helpful Hints for Electroplaters

A new series of folders has been issued by *Metallurgical Products Company*, Dept. MF, Philadelphia 45, Pa. They are being enthusiastically received each month by the electrotyping and electroplating industries. A set of five folders are sent free to any one interested in this field. Subjects considered are: "Problems Encountered in Electroforming"; "Analysis of Copper Sulphate"; "Volumetric Analysis of Copper"; "Concentration in Acid Copper Baths"; "Chemical Calculations". An additional five folders are in preparation; upon publication they will be offered free upon inquiry.

Full Automatic Plating Conveyors

A revision of *Bulletin No. FA-103* has been issued by the *Hanson-Van Winkle-Munning Company*, Dept. MF, Matawan, N. J. This bulletin, originally issued in June, 1946, has been reprinted with revisions covering the full line of plating conveyors, including the elevator type, the *Munning* type, the straight line type, special plating machines, caustic cleaning lines, tin plating lines, wire and cable plating and zipper plating.

Acid and Alkali Resistant Paint

A 26-page booklet entitled *Parlon—A Summary*, explains what this chlorinated rubber is, as manufactured by the *Hercules Powder Company*.

In the form of questions and answers, this attractively designed booklet covers information on chemical composition, appearance, significant properties, applications. When correctly formulated, Parlon-base paint is said to be resistant to 70% sulphuric acid, strong caustic, as well as many other of the corrosive liquids encountered in the plating room. Exhaust hoods, fans, tank linings, rack coatings are some applications of this material.

To obtain a copy of this booklet, or to secure a list of paints which contain Parlon, write Hercules Powder Company, Dept. MF, Cellulose Products, Wilmington 99, Del.

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TECHNICAL LITERATURE

Hard Chrome Uses and Methods, by *Arthur W. Logozzo*, published by *The Nutmeg Chrome Corporation*, Hartford, Conn., price $1.00.

The viewpoint of the author has been that of providing the manufacturer or engineer with a guide for fitting the hard chromium plating process into peace-time production. Mr. Logozzo explains hard chrome applications in the various industries together with the sequence of operations required for successful operations.

The use of hard chrome in the plastics industry is thoroughly covered; polishing, plating, finishing requirements and tools for hard chromium surfacing of molds are explained. Other chapters deal with hard chrome plating of gauges, machine parts, cutting tools, rubber molds, cast iron. A very important chapter on grinding hard chromium deposits explains the procedure involved.

The appendix covers physical char-

acteristics of plated chromium and contains considerable pertinent information, including comparative hardness, variations in Brinell hardness and melting points of metals, as well as comparative static friction of surfaces.

The brochure represents a compilation of facts about hard chromium plating which should be in the hands of all users of this type of plating.

How to cut costs by improved racking, how to design efficient racks, how to make racks that stand up, how to make anodizing racks, how to select the most efficient rack insulation and how to rack small parts are just a few of many topics covered in an unusually complete Plating Rack Manual by *William E. Belke* of the *Belke Manufacturing Company*, 947 North Cicero Ave., Chicago 51, Ill. Over 25 years of pioneering in the development of more efficient plating racks qualifies Mr. Belke as an authority on this subject.

144 pictures show actual production-proved racking methods. 30 full page plates are packed with Belke standard design racks, removable tips and cathode hooks.

Just a few of the subjects covered are—Positioning Difficult Articles for Plating, Spacing to Avoid Shading, Use of Auxiliary Anodes and Burning Bars, Determining the Most Effective Rack Style, Determining the Size of Frame Members, etc. One hundred 8½ x 11 pages attractively bound in hard cover. Price $5.00.

Guidebook-Directory Publication Date Postponed

The 1947 edition of the *Guidebook-Directory*, scheduled for publication on July 1st, has been delayed until the latter part of August.

The Guidebook-Directory, formerly the *Plating and Finishing Guidebook*, is known as the "Bible" of the metal finishing industry. This year, in addition to changing the name, the book will be considerably expanded. Included will be the *Metal Finishing Buyer's Directory*, formerly published separately, which contains a list of all the suppliers and their products in the finishing field. In addition, a complete section will be devoted to a list of the trade names in the industry, giving the trade name, the nature or type of product and the company and address of the firm producing it.

All subscribers to *Metal Finishing* who are paid in advance will receive copies of the Guidebook-Directory without cost; otherwise the price is $1.50.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Milwaukee Branch

Three important papers were presented at the annual meeting of the *Milwaukee Branch* of the *A. E. S.* on April 26, 1947, at the Schroeder Hotel in Milwaukee.

The speakers and their subjects were: *Mr. Frank K. Savage*, A. E. S. president, "Wage Incentives in the

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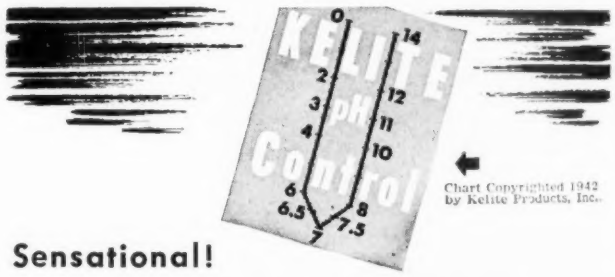

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Manufacturing Plants in
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Walter L. Pinner giving his talk at the Annual meeting of the Milwaukee Branch.

Plating Room"; *Mr. Walter L. Pinner*, A. E. S. past-president, "Bright Acid Copper Plating"; *Mr. Myron P. Diggin, Hanson-Van Winkle-Munning Company*, "The P. R. Plating Process."

In his paper, Mr. Savage stressed the fact that an incentive plan must have the mutual trust of labor and management. He said, "Many incentive systems have failed through improper planning, inadequate union leadership, and greedy management. However, the fact that some have failed is not a true test of their capabilities."

The annual banquet in the evening was attended by four hundred and thirty-two members and guests.

Los Angeles Branch

The design, installation and operation of metal degreasing equipment in which chlorinated solutions are employed was described during the educational session of the June 11 meeting of *Los Angeles Branch, American Electroplaters' Society*, by *William A. Venzel* of the *Southworth Company*, Los Angeles.

Mr. Venzel presented what was acclaimed by nearly all in attendance as the most completely instructive talk on the subject of degreasers that the branch has had the good fortune to hear.

He discussed vapor degreasing as it is used now rather than as it will or may be used in the future. The most important part of vapor degreasing, he emphasized, is the solution, which he referred to as ". . . the material which does the work of degreasing."

The speaker cited trichlorethylene and perchlorethylene as the two most widely used in vapor degreasing and described the respective qualities, boiling point and comparable values and properties. Trichlorehtylene, he said is the most widely used, while perchlorethylene finds its most extensive application in small machines which are not

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equipped with water closet condenser. The properties of the ethylene-dichloride solution were also touched upon by the speaker.

Mr. Venzel declared that proper consideration should be given to the selection of baskets and racks for degreasers. Baskets and racks, he suggested should be light, with rod construction preferable to angles and open mesh construction to permit drainage. He cautioned against the use of perforated buckets because proper drainage cannot be obtained.

A sound film, *Date Line Tomorrow*, showing the various finishes for aluminum developed during the war was presented through the courtesy of the Aluminum Corporation of America.

President Howard Woodward of the *Sundmark Supply Company* presided over the business session which immediately followed the close of the educational program.

Five new members were intiated:

Charles Greene, Columbia Broadcasting Company; *Alex Endemano*, Endemano Plating Company; *Charles Pratt*, National Carbon Company; *Donald Edwards*, United Chromium Company; and *Glenwood Beckwith*, Automatic Polishers, Inc.

The constitution committee, headed by *Earl Coffin*, recommended that the branch's delegates to the Supreme Society 1947 convention be instructed to vote against adoption at this year's conference of the proposed revisions in the national constitution and to propose that the 1947 convention give thorough consideration to and discussion of the matter, but defer action on adoption until 1948.

The branch voted to resume the annual picnics which were interrupted during the war. *Jack Beall* was named chairman of a picnic committee with authority to select a date (probably some Sunday in August) and location for the outing.

Guests at the June meeting included *W. W. Bostrum* and *R. C. Schmidt* of the newly established Alhambra Plating Company; *Glen Beckwith*, foreman of the plating department, Automatic Polishers, Inc.; *W. D. Burman*, DuLite Chemical Process; *Gus Maseret*, Ace Plating Company; *Charles*

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Sarco L S I Electric Control was installed on the first chromium tanks five years ago. The quality, speed and precision of this company's service established a reputation which made the plant one of the industry's leaders during the war years. Today every process is Sarco temperature controlled. Everything moves without interruption, annoying rejects, or shutdowns. It's clock-work precision that can be applied to any plating, chemical, food or textile plant at little cost. Ask for Catalog No: 1025.

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Green, Columbia Broadcasting Company; *John Ross*, Handy & Harman; *H. A. Mefford*, Mefford Chemical Company; *James Paulson*, Wyandotte Company; and *Sterling Pratt*, National Carbon Company.

News from California

By Fred A. Herr

Haig and *Richard Dulgarian*, operators of the *Standard Nickel-Chromium Plating Company*, 816 E. 62nd St., Los Angeles, have one of the most unique and largest hard chromium plating plants in the West. The plant was organized in 1916 by *George H. Dulgarian*.

Some of the oil well pipe-line hard chromium plating tanks are 22 feet deep. A variety of large and small inside and special anodes makes the plant one of the more interesting in Southern California.

It was erroneously stated in the May, 1947, issue of *Metal Finishing* that *Arnold Delrot* had joined the staff of the *L. H. Butcher Company* of Los Angeles as sales engineer. It was *Earl W. Arnold*, not Arnold Delrot, who joined the L. H. Butcher Company.

The five *Bostrom* brothers of Alhambra, Calif., have opened the *Alhambra Plating Company*, a new general job shop enterprise at 2017 Lemon St., Alhambra, a suburb of Los Angeles.

Associated in the venture are *E. D.*, *W. W.*, *E. F.*, *E. L.* and *B. D. Bostrom*, and *R. E. Schmidt*. Articles of incorporation have been applied for. The new shop initially has an area of 600 square feet of operating space. It is equipped with a 250 gallon cadmium tank and smaller copper and chrome facilities. The firm intends to specialize in cadmium plating, commercial polishing and rust proofing.

Edwin R. Calderon of Los Angeles is gradually building up one of the most completely equipped laboratories in Southern California for service in electro-chemical consultations, and testing and research on solutions, periodic cyclic reverse plating and general phases of plating shop design and layout.

The Calderon laboratory is located at 4700 Victoria Ave.

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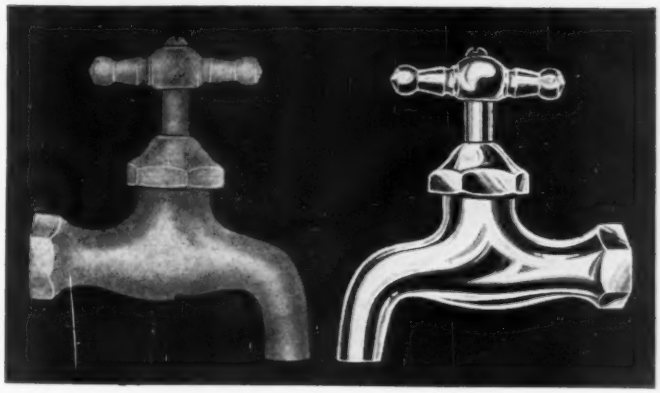

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Gives uniform results and continuous operation on all classes of work in still tanks and mechanical barrels. Substantially reduces plating costs. Brilliant, lustrous, nickel deposits that may be chromium plated, are produced by merely adding NEW IMPROVED LUSTREBRIGHT to your present cold nickel solution, if of standard formula.

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Turco Products, Inc., has announced the addition to its Los Angeles laboratory staff of *B. E. A. Moorhead*, graduate in chemistry of the California Institute of Technology, Pasadena. Moorhead now serves as an assistant chemist to chief chemist *Emmette R. Holman* at the Los Angeles headquarters of the firm.

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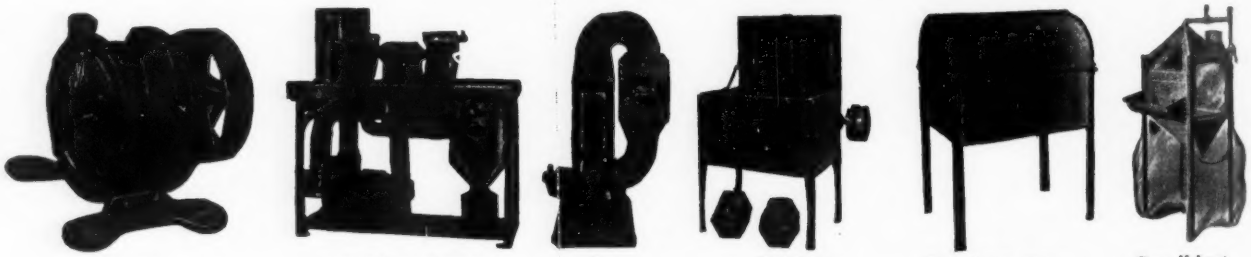
Herold Kroesche, a well-known name in the plating supply field in Southern California several years ago when he represented the *A. J. Lynch Company*, is again serving the west coast plating industry, now as technical sales engineer for *Harshaw Chemical Company's* Los Angeles division.

A visitor to California during May was *Dr. C. B. F. Young*, electro-metallurgist of Leonia, N. J. Dr. Young, who reported having developed a new type soluble buffing compound, visited Los Angeles and later San Francisco, to survey the field of possible west coast representation for the new product.

Kennard and Drake Laboratories were established in 1944 by *Dr. T. G. Kennard* and *John F. Drake*. Their first assignment concerned the atomic bomb research project in Hannover, Wash. The job involved pickling stainless steel to a prescribed finish, for which purpose a special laboratory was set up in Los Angeles. Today, Kennard & Drake serve as consultants, chemists and metallurgists — trouble-shooters for the plating and chemical industries.

J. F. "Jack" Beall, effective June 2nd, severed his connection with *Lauson Time, Inc.*, Pasadena, and joined the staff of the *A. J. Lynch Company*, Los Angeles, as director of sales and distribution of plating equipment and supplies. He had previously been affiliated with the *Harshaw Chemical Company* in Los Angeles. Beall is well known throughout the Southern California plating and organic finishing fields, is active in American Electroplaters' Society affairs, and served for a year as educational chairman of the Los Angeles A.E.S. Branch.

J. D. Pardee and *Robert O. Dean* of



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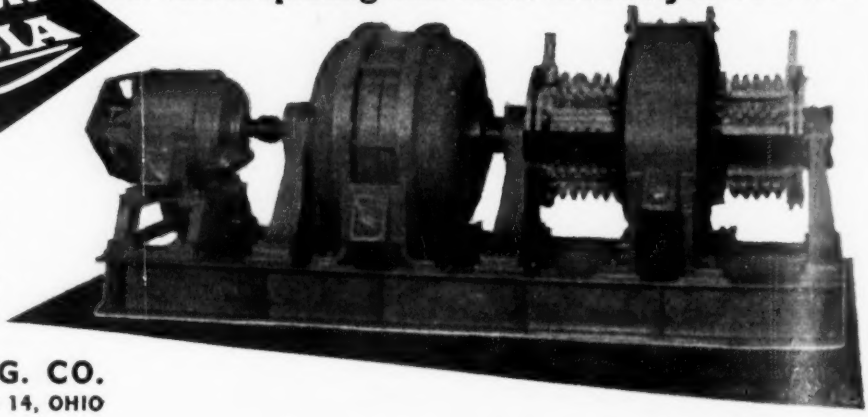

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Santa Monica, Calif., have construction underway on a new plating plant at 2210 Barry Ave., West Los Angeles. The building, costing an estimated $7,000 will measure 40x43 feet in dimension and be of reinforced concrete block construction.

During the past month articles of incorporation have been issued to the following firms:

Meffort Chemical Company, Los Angeles, articles of incorporation issued in the amount of $1,500,000. Directors are *Ernest C.* and *Harry A. Mefford* and *Eugene B. Lessing*.

Hawkins Chemical Company, Los Angeles, incorporated for $75,000, by *Henry W.* and *T. A. Hawkins* of Glendale, and *DeForrest Home* of North Hollywood.

Obituary

Charles Chace

The month of May witnessed the sad passing of *Charles "Charlie" Chace*, for many years prominent in the nation's plating councils.

Mr. Chace devoted his whole life to metal finishing. Born in Taunton, Massachusetts and attending the public schools there, he went to work as a youth at the Cohannet silver plant where he remained about three years. From there he went to *Poole Silver Company* in Taunton and worked with *Harry Flanagan*. He succeeded Harry as foreman after several years and later operated his own finishing shop locally for some time.

In 1924, *Gorham Mfg. Company*, Providence, R. I., invited him to work with them in the plating room as foreman and he operated in that capacity to the time of his death.

Mr. Chace was the successful president of Providence-Attleboro Branch for ten years when he first went to Providence and for the past six years had been a concientious Secretary-Treasurer. His co-operation saw the Branch grow in membership from a faithful dozen in 1927 to a hundred in 1947, and his personal efforts contributed largely to this success.

Earlier in his career he was local delegate many times to National Conventions and always represented the Branch with intelligence and dignity.

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110/125	7½	Hobart	220 V. 3 ph. 60 cy.	1750 RPM
150/175	7½	Roth	220 V. 3 ph. 60 cy.	1800 RPM
300	42	Elec. Prod.	20 HP 440 V. 3 ph. 60 cy.	1750 RPM
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